INSTRUCTION MANUAL

FOR

TYPE IFD-15FA DEMODULATOR

COMMUNICATION ELECTRONICS, INC.

6006 EXECUTIVE BOULEVARD ROCKVILLE, MARYLAND, 20852

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WARNING

The Demodulator main chassis used in conjunction with this plug-in module employs voltages which are dangerous and may be fatal if contacted. Extreme caution should be exercised when working with this unit when it is installed in the main chassis.

INTRODUCTION

The Types IFD-15B and IFD-15BA Demodulator Modules are nearly identical electrically and mechanically. They differ primarily in that the vendor of the crystal filter and discriminator changed. This necessitated minor changes to match the input and output impedances of the new filter. These changes are tabulated below, and should be incorporated in the parts list, paragraph 5.4.1, and schematic diagram, Figure 6-1. Once these changes are made the IFD-15B manual is entirely applicable to the IFD-15BA.

Part	Change to
C17	39 pf, Elmenco DM10-390J
C18	39 pf, Elmenco DM10-390J
C58	7.5 pf, Erie 301-000-COHO-759D
R64	5.1K, Allen-Bradley CB5125
R65	3.9K, Allen-Bradley CB3925
FL1	Piezo 5093575
FL2	Piezo 5093577

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Table 1-1. Type IFD-15B IF Demodulator, Specifications

Types of Reception	AM, FM, and CW
Center Frequency	21.4 mc
Dynamic Range	From noise up to 40 mv using AGC or manual gain control.
Bandwidth	15 kc ±1.5 kc
Distortion	AM: 5%, maximum, when modulated 30% at 1 kc rate FM: 5%, maximum, when modulated at 1 kc with 3 kc deviation.
Spurious Response	Response falls off smoothly to 60 db down without abrupt discontinuities or amplitude inversions.
Input Impedance	50 ohms; VSWR 1.5 to 1, maximum
Types of Gain Control	Normal (AGC), tracking or manual
Normal Gain Control	Internal AGC circuit maintains output level within 3 db over an input signal level range of +60 db from 43 μv. The AGC will respond to signal variations up to 3 cycles and roll off at approximately 12 db per octave. The AGC will hold the second detector output level to approximately 1 vdc on CW signals.
Tracking Gain Control	Module gain controlled by an external high performance, pulse-type AGC.
Manual Gain Control	A manual gain control is provided which will vary the gain from maximum to 60-db below maximum.
Stability with Normal (AGC) Gain Control	The center frequency will not change more than ±10% or the bandwidth by more than ±5% over the AGC range.
AGC Voltage Gain	Approximately 30 db
FM Output Stability	Output varies less than 6 db for an input signal level change greater than 60 db.
Beat Frequency Oscillator	Internal 21.4 mc BFO; adjustable ± 5 kc from demodulator main chassis. The BFO is stable to 100 cycles per minute at a constant temperature.
Video Output Bandwidth	1 kc, 3 kc, or 10 kc selectable by front panel switch
Video Amplifier	Video amplifier will drive a 93-ohm load up to the maximum level of the video (AM or FM)
Pre-detection Output	A 21.4 mc pre-detection output will provide 20 mv, minimum. This output will exhibit all AGC characteristics and will work into a 50-ohm load.
Shape Factor (60 to 6 db)	3 to 1
Ripple Across Pass Band	2 db, maximum
Input Power	+12 vdc at 60 ma, maximum, and -12 vdc at 30 ma, maximum
Size	4.5 inches high, 2.25 inches wide, and 13 inches deep
Weight	2.75 lbs, approximately

Table 1-2. Type IFD-15B IF Demodulator, Transistor Complement

Ref. Desig.	Type	Function
	Main Chassis	
Q1	2N2708	IF Amplifier
Q2	2N706	Oscillator-Doubler
Q3	2N706	Amplifier
Q4	2N2708	IF Amplifier
Q5	2N2708	IF Amplifier
Q6	2N2708	IF Amplifier
Q7	2N706	Limiter
Q8	2N706	Limiter
Q9	2N706	Limiter
Q10	2N706	Limiter
	Video Amplifier (A1)	
A1Q1	2N697	Emitter Follower
A1Q2	2N706	Emitter Follower
A1Q3	2N3251	Emitter Follower
	Video Amplifier (A2)	
A2Q1	2N3251	Amplifier
A2Q2	2N706	Amplifier
A2Q3	2N3251	Emitter Follower
A2Q4	2N706	Emitter Follower
	Video Amplifier (A3)	
A3Q1	2N697	Emitter Follower
A3Q2	2N706	Emitter Follower
A3Q3	2N3251	Emitter Follower
	AGC Amplifier	
A4Q1	2N697	DC Amplifier
A4Q2	2N697	Emitter Follower

SECTION I

GENERAL DESCRIPTION

1.1 ELECTRICAL DESCRIPTION

The type IFD-15B Demodulator is designed for the reception of AM, FM, and CW signals from a 21.4-mc IF signal input. This unit plugs in the type DM-4B Demodulator main chassis which furnishes the 21.4-mc input signal to the IFD-15B. The bandwidth of the IFD-15B is established at 15 kc by a crystal filter employed in the design. The bandwidth of the video output signal can be set to 1 kc, 3 kc, or 10 kc by a front-panel switch. Operating voltages, signal inputs, and signal outputs are connected to the unit from the DM-4B Demodulator main chassis. Three signals inputs are normally furnished from the DM-4B to the IFD-15B: a 21.4-mc IF input; a BFO tuning voltage input; and a tracking AGC voltage input. The IFD-15B provides five signal outputs to the DM-4B: a tuning meter voltage output; a video output; a 21.4-mc pre-detection output; an AGC monitor output; and a tracking video output. Solid state active components are used exclusively in the design to provide high reliability and low power consumption. Pertinent specifications for the IFD-15B are given in Table 1-1; the transistor complement is presented in Table 1-2.

1.2 MECHANICAL DESCRIPTION

As shown in Figure 1-1, the front panel of the IFD-15B mounts the MODE SEL switch, AGC SEL switch, VIDEO BANDWIDTH switch, the GAIN SET, and IF GAIN controls.

1.2.1 All inputs and outputs for the module are accomplished through the 15-pin Cannon connector on the rear apron of the module.

1.2.2 The main chassis and front panel are constructed of aluminum. The front panel is grey with an overlaid black-anodized etched plate. The IF chassis is constructed of brass which is silver-plated and gold-flashed to prevent tarnishing. Located within the chassis are four etched circuit boards which contain the components for three video amplifiers and an AGC amplifier.

Figure 1-1. Type IFD-15B IF Demodulator, Front View

Figure 2-1

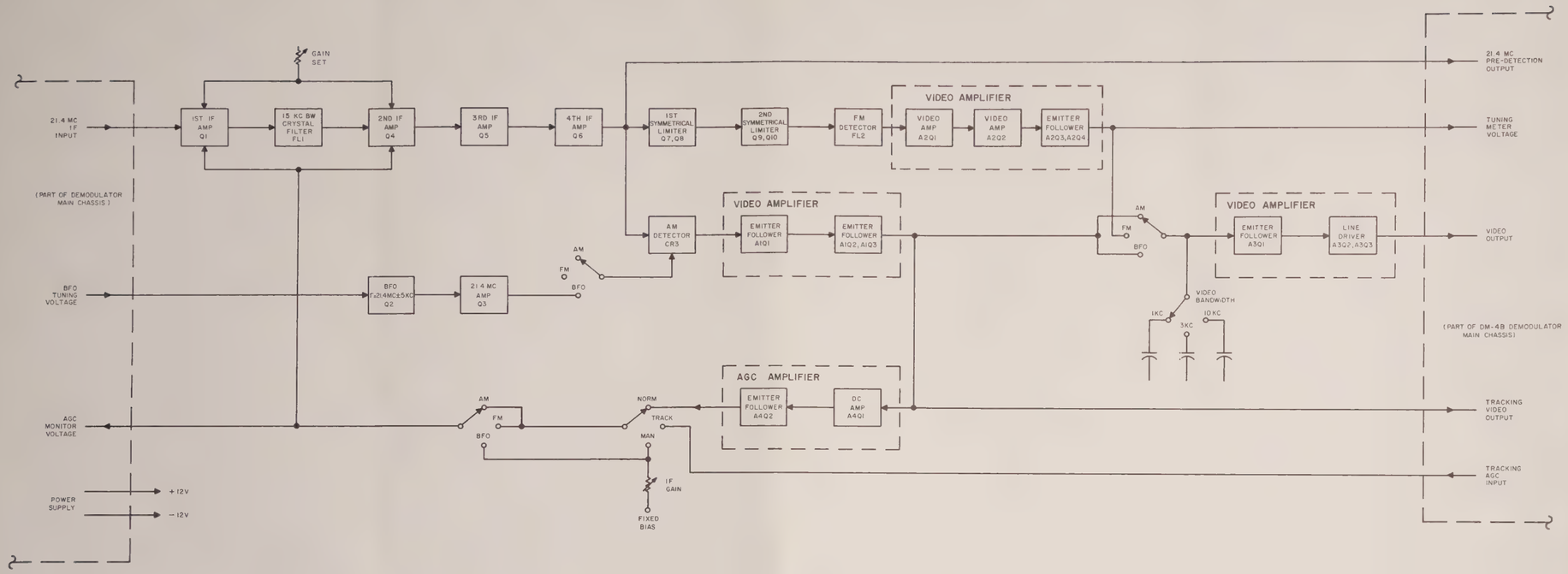

Figure 2-1. Type IFD-15B IF Demodulator, Functional Block Diagram

SECTION II

CIRCUIT DESCRIPTION

2.1 GENERAL

A circuit description of the type IFD-15B IF Demodulator is given in the following paragraphs using the block diagram, Figure 2-1, and the over-all schematic diagram, Figure 6-1. Note that the unit numbering system is used for the electrical components, which means that parts on subassemblies carry a prefix before the usual class letter and number of the item (such as A1C1 and A2Q1). These prefixes are omitted on illustrations and in the text except in those cases where confusion might result from their omission.

2.2 FUNCTIONAL ANALYSIS

The type IFD-15B IF Demodulator is one of several plug-in units which is used in conjunction with the DM-4B Demodulator main chassis. All of the plug-in modules operating voltages, signal inputs and outputs are coupled through connectors located on their rear aprons.

2.2.1 As shown in Figure 2-1, the 21.4-mc IF input signal enters the IFD-15B from the demodulator main chassis and is applied to the first IF amplifier stage, Q1. The output of the first IF stage is connected through a bandpass filter, FL1, to the second IF amplifier stage, Q4. The crystal filter (FL1) sets the bandwidth at 15 kc. Additional amplification at 21.4 mc is provided by the third and fourth IF stages, Q5 and Q6.

2.2.2 The 21.4-mc IF output from the fourth IF amplifier, Q6, is simultaneously applied to the AM detector, the FM limiters, and to the 21.4-mc pre-detection output. The signal path to the FM detector contains two symmetrical limiter stages (Q7, Q8 and Q9, Q10) which remove amplitude variations from the signal. The output of the second symmetrical limiter is demodulated by a crystal discriminator, FL2. The FM video signal from the crystal discriminator is applied to one of the three video amplifiers contained within the IFD-15B. This video amplifier contains amplifier stages, A2Q1 and A2Q2, and a complementary symmetry emitter follower, A2Q3 and A2Q4. The FM video signal from the emitter follower is connected to the FM position of the mode selector switch, and also to the tuning meter voltage output.

2.2.3 The AM video signal output from the AM detector is applied through an emitter follower stage, A1Q1, to a complementary symmetry emitter follower, A1Q2 and A1Q3, located on a second video amplifier assembly. The output of A1Q2 and A1Q3 is simultaneously connected to the AGC amplifier, the AM and BFO positions on the mode selector switch, and to the tracking video output. In certain operating modes, the DM-4B Demodulator main chassis (in conjunction with other plug-in modules) converts this tracking video signal to a dc voltage which re-enters the IFD-15B as the tracking AGC input.

2.2.4 In the AGC amplifier assembly, the AM video signal is applied to a dc amplifier stage, A4Q1. The voltage output of A4Q1 is applied to the emitter follower stage, A4Q2. If the AGC selector switch is in the NORM position and the mode selector switch is in either the AM or FM positions, then the output of stage A4Q2 is used to control the gain of the first and second IF amplifiers, Q1 and Q4.

2.2.5 Three gain control modes are possible during AM or FM reception: normal (NORM), tracking (TRACK), and manual (MAN). In any of these three AGC modes, the gain control voltage is applied to the base circuits of Q1 and Q4. Also, in any of these three gain control modes, the GAIN SET control provides additional gain control by varying the resistance in the emitter circuits of Q1 and Q4. In the normal mode, the AGC voltage is derived from the AM detector output through the AGC amplifier. In the tracking mode, the gain control voltage is provided by the DM-4B Demodulator main chassis and enters the IFD-15B as the tracking AGC input. In the manual mode, the gain of the IFD-15B is controlled by a voltage derived from the IF GAIN potentiometer. During CW reception (BFO position), only manual gain control is possible. The gain control voltage which is applied to stages Q1 and Q4 is also connected to the DM-4B Demodulator main chassis as the AGC monitor voltage.

2.2.6 The BFO (beat frequency oscillator) is activated when the mode selector switch is placed in the BFO position. The 21.4-mc output of the BFO stage, Q2, is amplified by Q3 and applied to the AM detector. The pitch of the CW audio signal is varied by means of a control located on the demodulator main chassis. This control furnishes a

variable dc voltage to the IFD-15B (BFO tuning voltage) which can shift the frequency of the BFO stage ±5 kc from the normal 21.4-mc output.

2.2.7 The FM video signal appears at the FM position of one of the mode selector switch sections. The AM video signal appears at the AM and BFO positions. Depending on the switch setting, either the FM or AM video signal is connected from the arm of this switch section to the input of the third video amplifier assembly. This amplifier contains an emitter follower (A3Q1) and a line driver (A3Q2, A3Q3). The video output from this line driver is connected to the DM-4B Demodulator main chassis. The video bandwidth switch, connected at the input of the video amplifier, sets the bandwidth of the video output at either 1 kc, 3 kc, or 10 kc.

2.3 IF AMPLIFIERS

The 21.4-mc IF input signal is connected through J1 and coupled through C2 to the first IF amplifier Q1. Resistor R1 terminates the input. The output of Q1 passes through the crystal bandpass filter, FL1, to the second IF amplifier, Q4. The filter has a bandwidth of 15 kc with a center frequency of 21.4 mc. The tuned circuits which include inductors L3 and L4, provide the necessary reactive loading at the input and output of the filter. The output of Q4 receives additional amplification in the third and fourth IF amplifier stages, Q5 and Q6. Coupling between these stages is through single-tuned circuits. Stages Q4 and Q5 are neutralized by feedback coupled through capacitors C22 and C29, respectively. The single-tuned collector circuit of Q6 provides inputs to the AM detector, the symmetrical limiters and the 21.4-mc pre-detection output.

2.4 AM DETECTOR

The AM detector, CR3, is a series diode operating on the positive excursions of the input signal. The output load resistor for the detector is R40 with filtering provided by C42. The AM detector output is coupled into the video amplifier (A1). Test point TP1 is provided to monitor the AM detector output.

2.5 VIDEO AMPLIFIER (A1)

The AM detector output is applied to the emitter follower, Q1. The output of Q1 is applied to the base of Q3 and simultaneously to the base of Q2 through diodes CR1 and CR2. Transistors Q2 and Q3 form a complementary symmetry emitter follower which operates essentially the same as a push-pull class B amplifier. Silicon diodes CR1 and CR2 serve a dual function. First, they off-set the dc bias level at the bases of Q2 and Q3 to compensate for their base-emitter junction voltage drops. Secondly, these diodes provide for stabilization with temperature changes. This is possible because the transistors and diodes are made of the same material, and therefore exhibit the same voltage-vs-temperature characteristics. Resistors R4 and R5, in the emitters of Q2 and Q3, primarily prevent thermal runaway, but also add to the temperature compensation of the stage. The video amplifier output is applied to the AGC amplifier, AGC tracking output, and a section of the MODE SEL switch.

2.6 LIMITER STAGES

The 21.4-mc signal from the capacitive voltage divider at the output of the fourth IF amplifier is applied to the first symmetrical limiter stage (Q7, Q8). With no input signal, Q7 and Q8 are conducting approximately equal currents through the common emitter resistor, R50. When an input signal is applied, positive excursions at the base of Q7 are reflected through its base-emitter junction to the common emitter junction. This reduces the bias level on Q8, and if the input signal is of sufficient amplitude, it will cut off. Negative excursions of the input signal decrease the bias level on Q7, causing a reduction of current through this transistor. This results in an increase of conduction through Q8, and causing it to go into saturation. Transistor Q8 can therefore operate between cut-off and saturation, effectively eliminating amplitude variations in the incoming signal. Diodes CR8, CR9 and CR10 clip extremely high amplitude signals to prevent these signals from causing damage to Q7 and Q8. The second limiter stage (Q9 and Q10) operates essentially the same as the first limiter. The output from Q10 is coupled through C52 to the FM discriminator.

2.7 FM DISCRIMINATOR

Demodulation of the FM carrier occurs in the crystal discriminator (FL2) which contains two crystals; one tuned 7.5 kc above and one 7.5 kc below the 21.4-mc carrier frequency. The necessary diodes for rectifying the input signal and loading resistors are contained within FL2. The demodulated output of the crystal filter is fed through L11, which suppresses any remaining carrier, to the video amplifier (A2). Test point TP4 is provided to monitor the discriminator output.

2.8 VIDEO AMPLIFIER (A2)

The demodulated signal from the FM discriminator is applied to the complementary amplifier stage (Q1, Q2). The amplified output is taken from Q2 and applied to the bases of transistors Q3 and Q4 which form a complementary symmetry emitter follower. Diodes CR2 and CR3 provide bias and temperature compensation (see discussion in paragraph 2.5). Diode CR1 provides additional dc stabilization. The output from the video amplifier is connected to a section of the MODE SELECTOR switch.

2.9 VIDEO AMPLIFIER (A3)

The input signal is applied through the MODE SEL switch from the video amplifier (A1) if the switch is in the AM or BFO modes, and from the video amplifier (A2) if the switch is in the FM mode. The video amplifier operation is essentially the same as the video amplifier (A1) previously described in paragraph 2.5. The output is connected to the Video Output. Test point TP3 is provided to monitor this output.

2.10 AGC AMPLIFIER

The AGC amplifier provides gain control for the first two IF amplifier stages, Q1 and Q4, when the AGC SEL switch is in the NORM position and the MODE SEL is set to either AM or FM. The AGC amplifier receives its input from video amplifier A1. Modulation filters (A4C1 and A4R1) at the input and (C28 and R28) at the output of the amplifier, A4Q1, permit this stage to amplify only the average changes in carrier level. Emitter follower A4Q2 provides isolation between the AGC amplifier, A4O1. and the IF amplifier stages being gain controlled.

2.11 MODE SELECTOR SWITCH

The MODE SEL switch, S1, is a three-position, three-wafer switch which is used to select the mode of operation: AM, FM or BFO. Section S1A connects the output from video amplifier A1 or video amplifier A2, depending on the switch position, to video amplifier A3. Section S1B connects +12 volts to the beat frequency oscillator when in the BFO position, and -12 volts to the BFO when in the AM or FM positions. Section S1C operates in conjunction with the AGC SEL switch to establish the gain control mode. In addition, the AGC monitor and signal strength meter outputs are taken from section S1C.

2.12 AGC SELECTOR SWITCH

The AGC SEL switch, S2, is a three-position switch permitting front panel control of the type of gain control used for the first and second IF amplifiers. When the switch is in the NORM position, the internal AGC amplifier output is used to control the gain of the first and second IF amplifiers. In the TRACK position, a tracking AGC voltage is supplied from the DM-4B Demodulator main chassis to control the gain of these stages. With the switch in the MAN position, the IF GAIN control is used to vary the gain of the two stages.

2.13 VIDEO BANDWIDTH SWITCH

The VIDEO BANDWIDTH switch, S3, is connected to the input circuit to the video amplifier (A3). This switch is used to set the video output bandwidth at 1 kc, 3 kc or 10 kc by selecting capacitor C51, C53 or C63 which operates in conjunction with R62 or R65 to form a low pass filter.

2.14 BEAT FREQUENCY OSCILLATOR

The BFO is used to produce a beat note when receiving CW signals. It operates only when the MODE SEL switch is in the BFO position. This applied +12 volts to Q2 and Q3. Transistor Q2 operates as a Colpitts oscillator and frequency doubler. The base circuit resonates at approximately 10.7 mc and the collector circuit is tuned to 21.4 mc. The 21.4 mc BFO signal is applied to the emitter of amplifier stage Q3. From the single-tuned collector circuit of Q3, the signal is coupled through C20 to the AM detector. The pitch of the beat note produced can be varied by the BFO tuning control on the DM-4B front panel. This control varies the dc voltage across the voltage-variable capacitor CR1. A voltage variable capacitor is a solid-state device whose capacitance varies as a function of the voltage applied across its terminals. Since CR1 and series capacitor C5 provide a capacitance which shunts the tuned circuit in the base of Q2, changing the capacitance of CR1 changes the oscillator frequency. Positioning the MODE SEL to any other setting applies -12 volts to the BFO. This turns off the BFO and forward biases CR2. The low impedance of CR2 in the conducting state prevents the tuned circuit (L5 and C19) from affecting the AM response.

SECTION III

INSTALLATION AND OPERATION

3.1 INSTALLATION

The type IFD-15B IF Demodulator is designed to operate in conjunction with the DM-4B Demodulator. This module will operate in any of the four DM-4B module positions. Approximate space requirements are: 4.5 inches high, 2.25 inches wide, and 13.5 inches projection into the DM-4B. Adequate ventilation should be provided for proper operation of the module and also to prevent unnecessary aging of components.

3.1.1 Inserting Module. - Place the module in any one of four positions in the DM-4B. The guide pins on the rear apron of the module will properly seat the receptacle on the rear of the module with the receptacle at the rear of the slot of the DM-4B into which the module is being placed.

3.1.2 Inputs/Outputs. - All signal inputs and outputs of the module are accomplished through the 15-pin connector on the rear apron of the module.

3.1.3 Operating Voltages. - The necessary operating voltages for the module are supplied by the DM-4B. The power/on-off switch is located on the DM-4B front panel.

3.2 OPERATION

The operating controls on the front panel of the module are described in the following paragraphs; these controls are shown in Figure 1-1.

3.2.1 AGC Selector. - The AGC SEL switch determines the type of gain used for the module: NORM, TRACK or MAN. The normal AGC is provided by circuitry within the module. The tracking AGC is supplied from the demodulator main chassis. The manual type of gain control is controlled by the IF GAIN potentiometer.

3.2.2 Mode Selector. - Set the MODE SEL switch to the AM, FM or BFO (for CW reception) positions as desired before tuning. In the BFO position, the gain must be manually adjusted using the IF GAIN control.

3.2.3 Video Bandwidth. - The VIDEO BANDWIDTH switch allows the operator to select one of three video output bandwidths as marked on the panel.

3.2.4 Gain Set. - The GAIN SET potentiometer varies the gain of the first and second IF amplifiers by ±6 db.

3.2.5 IF Gain. - This control varies the amount of gain control voltage applied to the first and second IF amplifiers when the AGC SEL switch is in the MAN position and the MODE SEL switch is in the AM, FM or BFO position.

SECTION IV

MAINTENANCE

4.1 GENERAL

The type IFD-15B IF Demodulator has been carefully designed so that it will operate for long periods of time with little more than routine maintenance. Should trouble occur, it is important that maintenance personnel be familiar with Section II, in which the circuits are described. In addition, they should refer to Figures 5-1 through Figure 5-9 where the component locations are shown; to the schematic diagram, Figure 6-1; and to Table 4-1, the transistor pin socket voltages.

CAUTION

All maintenance work within this unit should be kept to a minimum and performed only by trained and experienced personnel. The placement of components and the dress of leads in the equipment have been carefully engineered to give optimum performance. In replacing any components, great care should be exercised to duplicate the exact physical layout of the original assembly.

4.2 TROUBLESHOOTING

Most troubles will be caused by failures of the transistors or diodes. The proper functioning of all these parts should be assured by either test or by replacement with parts known to be good before any further troubleshooting is carried out. After the above measure has been carried out, initial troubleshooting should be directed towards localizing the problem to a specific portion of the unit. One procedure which should be considered for localizing troubles is to feed in a signal at the input and then check the signals present at each test point. To this end, it is desirable that all maintenance personnel familiarize themselves with the alignment procedures, even if an alignment is not required, because those procedures include methods of checking performance which may help in analyzing the cause of the trouble. In addition, be certain that the power supply is functioning normally before any other circuit is suspected. Table 4-2 contains guides which may be useful in troubleshooting.

4.3 ALIGNMENT INSTRUCTIONS

The alignment procedures in this book are suitable for performance in the field when making periodic performance checks, or when making adjustments after replacing components. Only those controls specifically referred to within a series of steps given for aligning a particular circuit affect the work in that circuit. Those controls not mentioned in any one series of steps may be left in any position. The alignment of this unit should be performed only with suitable equipments by technicians thoroughly familiar with their use. If the limits and tolerances specified in the following steps cannot be obtained during a field alignment, a factory alignment is necessary. Allow several minutes for warm-up before beginning the work.

4.3.1 Use of Marker During Alignment. - A post-detection type of marker adder is recommended, and the alignment procedures in this book assume that one is to be used. However, if such a marker adder is not available, the marker generator output should be loosely coupled to the sweep generator output. This can be done by connecting the marker signal source to a turn or two of insulated wire wrapped around the sweep generator lead near the point of connection to the circuit under test, or by coupling to the sweep generator lead through a small capacitor. To insure that the addition of the marker is not affecting the response curve, disconnect the marker generator and observe that no change in the curve's shape or symmetry occurs.

4.3.2 Use of Oscilloscope During Alignment. - The vertical and horizontal amplifier inputs on the oscilloscope should be set in the dc coupled mode. The dc component of the signal on the vertical input should be cancelled by applying an equal voltage to the unused vertical differential scope input, since the dc component sometimes makes it impossible to center the signal vertically. Otherwise it will sometimes be necessary to use the ac coupled mode. A low-capacity shielded cable should be used to connect to the oscilloscope, and the shield should

be grounded as closely as possible to the point to which the center conductor is connected.

4.3.3 Equipments Required. - The following equipments, or their equivalents, are required to perform the complete IFD-15B alignment:

(1) Sweep Generator, Boonton Model 202E
(2) Univerter, Boonton Model 207E
(3) Power Supply, Boonton Model 207EP
(4) Oscilloscope, Tektronix Type 503
(5) Signal Generator, Hewlett Packard 606A
(6) Oscillator, Hewlett Packard 200CD
(7) Frequency Counter, Computer Measurements Corp. 738A
(8) Demodulator, Communication Electronics Type DM-4B
(9) Test cable, Communication Electronics Type EC-101B, or one fabricated using one Cannon DBM-17W-2P connector (with two DM53740-5001 inserts), and one Cannon DBM-17W-2S connector (with two DM53742-5001 inserts).
(10) Assorted cable, connectors, and alignment tools

4.4 ALIGNMENT PROCEDURE

The over-all alignment is given in the following paragraphs

4.4.1 Initial Settings and Calibration. - Adjust the controls as follows. After initial adjustment, do not change position of any control unless instructed to do so.

(1) Place MODE SEL in AM position.
(2) Set AGC SEL in MAN position.
(3) Rotate GAIN SET to maximum cw setting.
(4) Calibrate signal generator/univerter output to 21.4 mc using frequency counter.
(5) Adjust signal generator output attenuator for 43 μv.
(6) Connect equipment as shown in Figure 4-1.
(7) Adjust IF GAIN control for 1 vdc output from TP1.

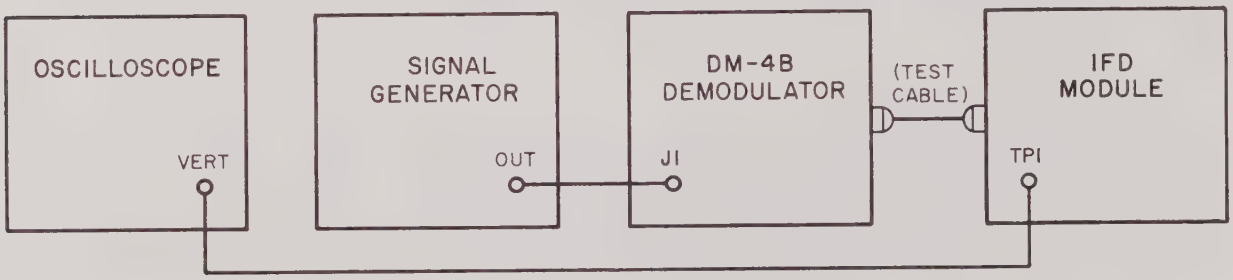

Figure 4-1. Equipment Setup, Calibration and BFO Alignment

4.4.2 IF Alignment. - Proceed as follows:

(1) Connect equipment as shown in Figure 4-2.
(2) Adjust sweep setup sweep width and oscilloscope controls until a response curve is displayed.
(3) Adjust signal generator output attenuator for a 1.0 volt peak-to-peak response curve.
(4) Adjust L3, L4, L6, L7 and L8 for a response curve similar to the curve shown in Figure 4-3. During the adjustment of these inductors, decrease IF GAIN control setting as necessary to maintain desired amplitude of response curve.

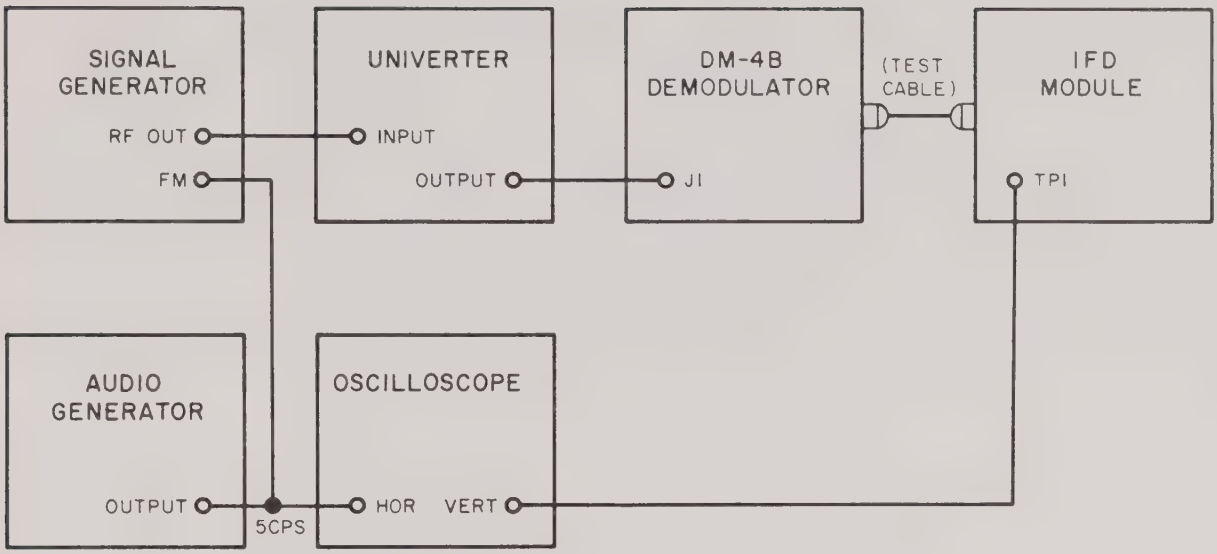

Figure 4-2. Equipment Setup, IF Alignment

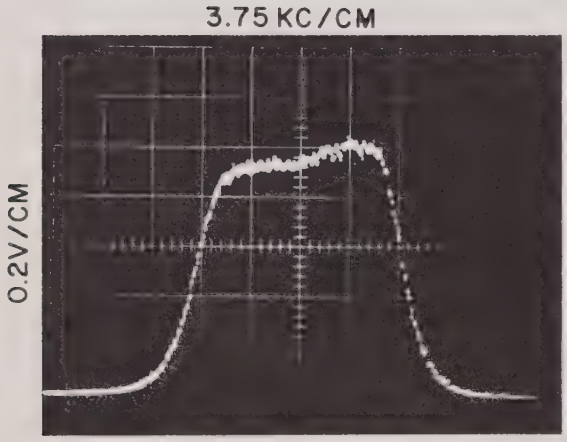

Figure 4-3. Typical Response Curve, IF Alignment

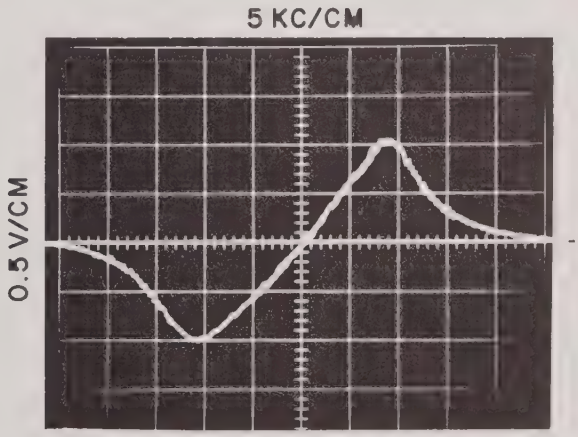

Figure 4-4. Typical Response Curve, Discriminator Alignment

4.4.3 Discriminator Alignment. - Proceed as follows:

(1) Connect the equipment as shown in Figure 4-2, except that the vertical oscilloscope input is connected to TP4.
(2) Adjust the sweep setup for a 21.4 mc center frequency at a level of approximately 43 μv.
(3) Adjust the sweep setup sweep width and oscilloscope controls until a response curve is displayed.

6. Adjust L1 for the response curve similar to one shown in Figure 4-4. The [illegible] the negative and positive peaks is [illegible].

[illegible] Proceed as follows.

1. Calibrate signal generator/universe output to 21.4 mc using the frequency counter.
2. Connect equipment as shown in Figure 4-1.
3. Set the MODE SEL switch in the BFO position.
4. Set IF GAIN control at approximately 3/4 maximum cw position.
5. Set BFO TUNING control on DM-48 to mid-range.
6. Adjust signal generator output level to approximately 43 µv.
7. Adjust L2 and L3 for a maximum dc voltage output at TP1. Adjust L1 for a [illegible]

Table 4-1. Transistor Socket Pin Voltages

Ref. Desig.	Type	Transistor Element		
		Emitter	Base	Collector
Q1	2N2708	1.7	2.3	11.5
Q2*	2N706	2.9	2.9	8.0
Q3*	2N706	2.2	2.6	9.0
Q4	2N2708	2.1	2.7	9.0
Q5	2N2708	0.7	1.4	9.4
Q6	2N2708	1.8	2.6	11.0
Q7	2N706	2.3	3.0	10.2
Q8	2N706	2.3	3.0	10.4
Q9	2N706	2.4	2.6	10.6
Q10	2N706	2.4	2.7	10.6
A1Q1	2N697	6.8	7.2	11.5
A1Q2	2N706	7.4	8.3	11.5
A1Q3	2N3251	7.2	6.8	-11.5
A2Q1	2N3251	1.2	0.5	-10.8
A2Q2	2N706	-11.5	-10.8	0.32
A2Q3	2N3251	1.0	0.32	-11.5
A2Q4	2N706	1.0	1.7	11.5
A3Q1	2N697	6.8	7.2	11.5
A3Q2	2N706	7.4	8.3	11.5
A3Q3	2N3251	7.2	6.8	-11.5
A4Q1	2N697	0.3	0.1	11.0
A4Q2	2N697	10.4	11.0	11.5

Test Conditions: All voltages are positive dc with respect to chassis unless otherwise noted. The DM-4B was used as the power source; 120 vac was applied to the DM-4B. Readings taken with an RCA WV-98B VTVM. Control settings as follows: MODE SEL in AM; AGC SEL in NORM: GAIN SET at max cw; IF GAIN at max cw; VIDEO BANDWIDTH at 10 KC. No input signal applied.

Notes: *MODE SEL in BFO.

Table 4-2. Type IFD-15B IF Demodulator, Troubleshooting Chart

SYMPTOM	PROBABLE CAUSE	REMEDY
No output at TP3.	a. Defective video amplifier A3.	a. Check for input to A3Q1. Check A3Q1-A3Q3 and replace as necessary.
No output at TP3 in one bandwidth position, signal output present in others.	a. Defective capacitor.	a. Check C51, C53 or C63. Replace if necessary.
No tuning meter signal output.	a. Defective video amplifier A2.	a. Check for signal at TP4. Check A2Q1-A2Q4 and replace as necessary.
No output at TP3 with AM signal applied.	a. Defective video amplifier A1.	a. Check for signal at TP1. Check A1Q1-A1Q3 and replace as necessary.
No output at TP1 with AM signal applied.	a. Defective detector CR3.	a. Check for output from Q6. Check CR3 and replace if necessary.
No output at TP4 with FM signal applied.	a. Defective discriminator FL2.	a. Check for output from Q10. Replace FL2.
No output from Q10.	a. Defective limiter stage.	a. Check for input to Q7. Check Q7-Q10 and replace as necessary.
No input to Q7.	a. Defective diode.	a. Check dc bias level at base of Q7. Check CR9 and CR10 and replace as necessary.
No output from Q6.	a. Defective amplifier stage.	a. Check for output from FL1. Check Q4-Q6 and replace as necessary.

Table 4-2. Type IFD-15B IF Demodulator, Troubleshooting Chart - (Cont'd)

SYMPTOM	PROBABLE CAUSE	REMEDY
No output from FL1.	a. Defective crystal filter.	a. Check for input to FL1. Replace if necessary.
No output from Q1.	a. Defective amplifier stage.	a. Check for input to Q1. Check Q1 and replace if necessary.
No input to Q1.	a. Defective cable or connection.	a. Check W1 for continuity and repair or replace as necessary.
GAIN SET control inoperative.	a. Defective capacitor or potentiometer.	a. Check C61, C64 and R33. Replace as necessary.
No AGC control in NORM mode.	a. Defective AGC amplifier.	a. Check A4Q1-A4Q2 and replace as necessary.
IF GAIN control inoperative in the MAN mode.	a. Defective resistor.	a. Check R41, R44 and R58. Replace as necessary.
BFO inoperative.	a. Defective transistor.	a. Check Q2 and Q3. Replace as necessary.
BFO frequency cannot be varied.	a. Defective voltage-variable capacitor.	a. Check for variable voltage at C1. Replace CR1.

SECTION V

REPLACEMENT PARTS LIST

5.1 UNIT NUMBERING METHOD

The unit numbering method of assigning reference designations (electrical symbol numbers) has been used to identify assemblies, subassemblies (and modules), and parts. An example of the unit method follows:

A1R1

Subassembly Designation — Class and No. of item

Read from right to left as: First (1) resistor (R) of first (1) subassembly (A)

As shown on the main chassis schematic, components which are an integral part of the main chassis have no subassembly designation.

5.2 REFERENCE DESIGNATION PREFIX

Partial reference designations have been used on the equipment and on the illustrations in this manual. The partial reference designations consist of the class letter(s) and identifying item number. The complete reference designations may be obtained by placing the proper prefix before the partial reference designations. Prefixes are provided on drawings and illustrations following the notation "REF DESIG PREFIX".

5.3 LIST OF MANUFACTURERS

Vendor Code	Name and Address	Vendor Code	Name and Address
01121	Allen-Bradley Company 136 West Greenfield Avenue Milwaukee, Wisconsin	71468	Cannon Electric Company 3208 Humbolt Street Los Angeles, California
01281	Pacific Semiconductors, Inc. 10451 West Jefferson Boulevard Culver City, California	71590	Centralab 900 East Keefe Avenue Milwaukee, Wisconsin
01295	Texas Instruments, Inc. 6000 Lemmon Avenue Dallas, Texas	72982	Erie Technological Products, Inc. 644 West 12th Street Erie, Pennsylvania
02114	Ferroxcube Corporation of America Saugerties, New York	74868	Amphenol RF Division 33 East Franklin Street Danbury, Connecticut
02735	Radio Corporation of America 415 South Fifth Street Harrison, New Jersey	81716	Oak Manufacturing Company Crystal Lake, Illinois
04013	Taurus Corporation 8 Coryell Street Lambertville, New Jersey	84171	Arco Electronics, Inc. Community Drive Great Neck, New York
04713	Motorola Semiconductor Products 5005 East McDowell Road Phoenix, Arizona	84411	TRW Capacitor Division Thompson Ramo Woolridge, Inc. 112 West First Street Ogallala, Nebraska

Vendor Code	Name and Address	Vendor Code	Name and Address
07910	Continental Devices Corporation 12515 Chadion Avenue Hawthorne, California	91418	Radio Materials Corporation 4242 West Bryn Mawr Avenue Chicago, Illinois
14632	Communication Electronics, Inc. 6006 Executive Boulevard Rockville, Maryland	93332	Sylvania Electric Products, Inc. 1740 Broadway New York, New York
37942	P. R. Mallory and Company 80 South Gray Street Indianapolis, Indiana	95121	Quality Components, Inc. St. Marys, Pennsylvania
56289	Sprague Electric Company 91 Marshall Street North Adams, Massachusetts	99172	Midland 3151 Fiberglas Road Kansas City, Kansas
71450	Chicago Telephone Supply Corp. 1142 West Beardsley Avenue Elkhart, Indiana		

5.4 PARTS LIST

When ordering replacement parts from CEI, specify the type and serial number of the equipment, and the reference designation and description of each part ordered. The Vendors and Vendor Part Numbers listed are included as a guide to the user of the equipment in the field and do not necessarily agree with the parts installed in the equipment. Except in those cases specifically noted, the replacement part may be obtained from any vendor as long as the physical and electrical parameters of the part selected agree with the original part.

NOTE

As improved semiconductors become available it is the policy of CEI to incorporate them in proprietary products. For this reason some transistors and diodes installed in an equipment may not agree with those specified in the parts lists and schematic diagrams of this manual. However, the semiconductors designated in the manual may be substituted in every case with satisfactory results.

5.4.1 Main Chassis

Ref. Desig.	Description	Vendor Part No.	Vendor Code
A1	VIDEO AMPLIFIER	10949-1	14632
A2	VIDEO AMPLIFIER	10967-1	14632
A3	Same as A1		
A4	AGC AMPLIFIER	10383-1	14632
C1	CAPACITOR, CERAMIC FEEDTHRU: 1000 pf, GMV, 500V	FA5C-102W	01121
C2	CAPACITOR, CERAMIC DISC: 1000 pf, GMV, 500V	SM	91418
C3	CAPACITOR, CERAMIC TUBULAR: 10 pf, ±.5 pf (TC-N750)	301-000-U2J0-100D	72982
C4	CAPACITOR, DIPPED MICA: 43 pf, 5%	DM10-430J	84171
C5	CAPACITOR, DIPPED MICA: 47 pf, 5%	DM10-470J	84171
C6	Same as C1		
C7	CAPACITOR, DIPPED MICA: 180 pf, 5%	DM10-181J	84171
C8	CAPACITOR, DIPPED MICA: 160 pf, 5%	DM10-161J	84171
C9	CAPACITOR, CERAMIC DISC: .0015 μf, 10%, 500V	ID-152	71590
C10	Same as C2		
C11	CAPACITOR, DIPPED MICA: 100 pf, 5%	DM10-101J	84171
C12	CAPACITOR, DIPPED MICA: 910 pf, 5%	DM15-911J	84171
C13	CAPACITOR, CERAMIC DISC: .01 μf, 20%, 200V	4835-000-Z5U0-103M	72982
C14	Same as C2		
C15	Same as C13		
C16	Same as C1		
C17	CAPACITOR, DIPPED MICA: 68 pf, 5%	DM10-680J	84171
C18	Same as C17		
C19	CAPACITOR, DIPPED MICA: 51 pf, 5%	DM10-510J	84171
C20	CAPACITOR, CERAMIC TUBULAR: 2.2 pf, ±.25 pf	301-000-COJO-229C	72982
C21	Same as C13		
C22	CAPACITOR, COMPOSITION TUBULAR: .68 pf, 10%	QC	95121
C23	CAPACITOR, CERAMIC DISC: .005 μf, 20%, 500V	SM	72982
C24	Same as C13		
C25	Same as C17		
C26	CAPACITOR, DIPPED MICA: 200 pf, 5%	DM10-201J	84171
C27	Same as C5		
C28	CAPACITOR, ELECTROLYTIC: 1.5 μf, 20%, 35V	150D155X0035B2	56289
C29	Same as C22		
C30	Same as C23		

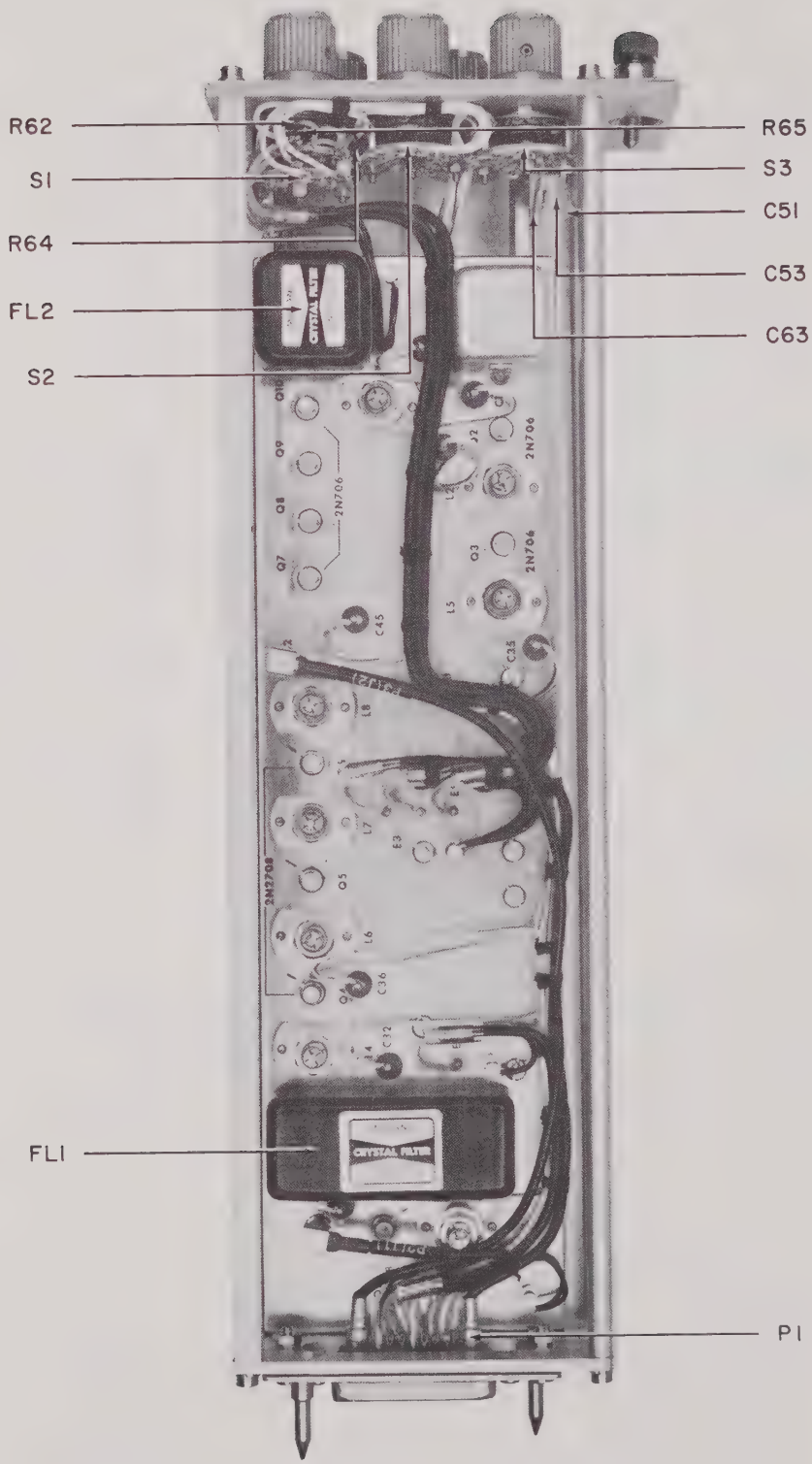

Figure 5-1. Type IFD-15B IF Demodulator, Left Side View

Ref. Desig.	Description	Vendor Part No.	Vendor Code
C31	Same as C5		
C32	Same as C1		
C33	Same as C17		
C34	Same as C26		
C35	Same as C1		
C36	Same as C1		
C37	Same as C23		
C38	Same as C2		
C39	CAPACITOR, DIPPED MICA: 33 pf, 5%, 500V	DM10-330J	84171
C40	Same as C5		
C41	CAPACITOR, DIPPED MICA: 560 pf, 5%	DM15-561J	84171
C42	Same as C17		
C43	Same as C13		
C44	Same as C23		
C45	Same as C1		
C46	Same as C1		
C47	Same as C2		
C48	Same as C23		
C49	Same as C2		
C50	CAPACITOR, CERAMIC DISC: .1 μf, +80 -20%, 10V	UK10-104	71590
C51	CAPACITOR, PAPER TUBULAR: .068 μf, 10%, 100V	663-UW	84411
C52	CAPACITOR, DIPPED MICA: 56 pf, 5%	DM10-560J	84171
C53	CAPACITOR, PAPER TUBULAR: .022 μf, 10%, 100V	663-UW	84411
C54	Same as C23		
C55	Same as C1		
C56	Same as C1		
C57	Same as C13		
C58	CAPACITOR, DIPPED MICA: 15 pf, 5%	DM10-150J	84171
C59	CAPACITOR, DIPPED MICA: 24 pf, 5%	DM10-240J	84171
C60	Same as C1		
C61	CAPACITOR, ELECTROLYTIC, TANTALUM: 47 μf, 10%, 6V	150D476X9006B2	56289
C62	CAPACITOR, DIPPED MICA: 150 pf, 5%, 500V	DM10-151J	84171
C63	Same as C23		
C64	Same as C13		
CR1	DIODE, CAPACITOR	V27E	01281
CR2	DIODE	1N462A	07910

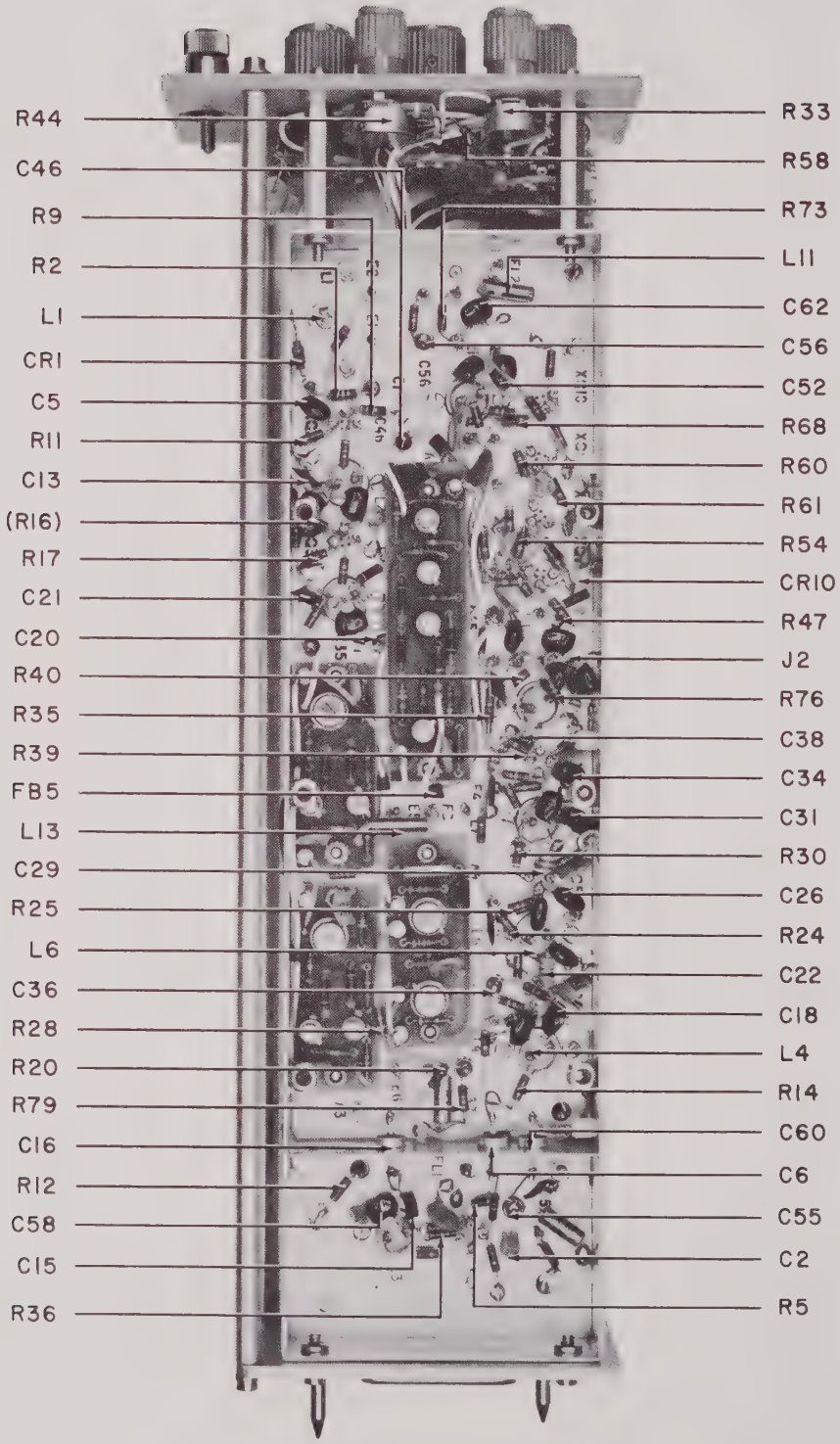

Figure 5-2. Type IFD-15B IF Demodulator, Right Side View

Ref. Desig.	Description	Vendor Part No.	Vendor Code
CR3	DIODE	1N198	93332
CR4	NOT USED		
CR5	NOT USED		
CR6	NOT USED		
CR7	NOT USED		
CR8	Same as CR3		
CR9	DIODE	1N753A	04713
CR10	Same as CR3		
E1	FEEDTHRU, TEFLON	SFU-16	04013
E2	Same as E1		
E3	Same as E1		
E4	Same as E1		
E5	Same as E1		
E6	Same as E1		
FB1	FERRITE BEAD	56-590-65/4A	02114
FB2	Same as FB1		
FB3	Same as FB1		
FB4	Same as FB1		
FB5	Same as FB1		
FB6	Same as FB1		
FL1	FILTER, CRYSTAL: 15 KC	DR-5	99172
FL2	DISCRIMINATOR, FILTER: 15 KC	AR-6	99172
J1	RECEPTACLE, SUB-MINIATURE	27-9	74868
J2	Same as J1		
L1	COIL, VARIABLE	1113	14632
L2	COIL, VARIABLE	1472-1	14632
L3	COIL, VARIABLE	1472-4	14632
L4	COIL, VARIABLE	1472-3	14632
L5	COIL, VARIABLE	1472-2	14632
L6	Same as L4		
L7	Same as L4		
L8	Same as L4		
L9	COIL, FIXED	1131-41	14632
L10	Same as L4		
L11	COIL, FIXED	1131-37	14632
L12	Same as L11		

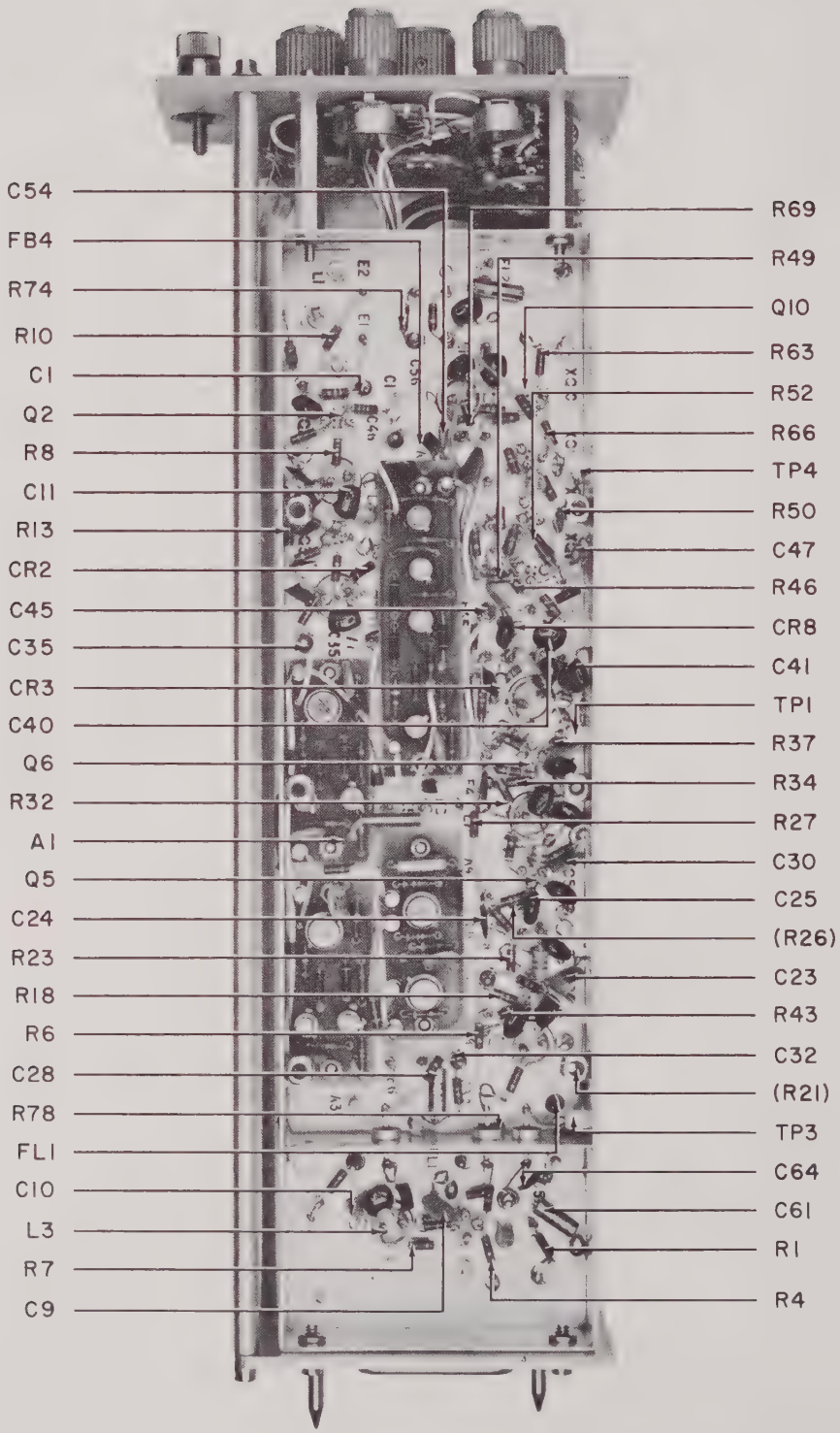

Figure 5-3. Type IFD-15B IF Demodulator, Right Side View

Ref. Desig.	Description	Vendor Part No.	Vendor Code
L13	Same as L11		
P1	CONNECTOR, PLUG MULTIPIN, w/2 coaxial inserts DM53740-5001, p/o W1 and W2	DBM-17W-2P	71468
P2	CONNECTOR, PLUG, SUB-MINIATURE, p/o W1	27-26	74868
P3	Same as P2, p/o W2		
Q1	TRANSISTOR	2N2708	02735
Q2	TRANSISTOR	2N706	01295
Q3	Same as Q2		
Q4	Same as Q1		
Q5	Same as Q1		
Q6	Same as Q1		
Q7	Same as Q2		
Q8	Same as Q2		
Q9	Same as Q2		
Q10	Same as Q2		
R1	RESISTOR, FIXED, COMPOSITION: 51Ω, 5%, 1/4W	CB5105	01121
R2	RESISTOR, FIXED, COMPOSITION: 240K, 5%, 1/4W	CB2445	01121
R3	RESISTOR, FIXED, COMPOSITION: 15K, 5%, 1/4W	CB1535	01121
R4	RESISTOR, FIXED, COMPOSITION: 5.1K, 5%, 1/4W	CB5125	01121
R5	RESISTOR, FIXED, COMPOSITION: 1K, 5%, 1/4W	CB1025	01121
R6	RESISTOR, FIXED, COMPOSITION: 3K, 5%, 1/4W	CB3025	01121
R7	RESISTOR, FIXED, COMPOSITION: 47Ω, 5%, 1/4W	CB4705	01121
R8	RESISTOR, FIXED, COMPOSITION: 43K, 5%, 1/4W	CB4335	01121
R9	Same as R8		
R10	RESISTOR, FIXED, COMPOSITION: 33Ω, 5%, 1/4W	CB3305	01121
R11	RESISTOR, FIXED, COMPOSITION: 2.2K, 5%, 1/4W	CB2225	01121
R12	RESISTOR, FIXED, COMPOSITION: 620Ω, 5%, 1/4W	CB6215	01121
R13	Same as R5		
R14	RESISTOR, FIXED, COMPOSITION: 510Ω, 5%, 1/4W	CB5115	01121
R15	RESISTOR, FIXED, COMPOSITION: 12K, 5%, 1/4W	CB1235	01121
R16	Same as R4		
R17	Same as R5		
R18	RESISTOR, FIXED, COMPOSITION: 30K, 5%, 1/4W	CB3035	01121
R19	RESISTOR, FIXED, COMPOSITION: 10K, 5%, 1/4W	CB1035	01121
R20	RESISTOR, FIXED, COMPOSITION: 100Ω, 5%, 1/4W	CB1015	01121
R21	Same as R6		
R22	RESISTOR, FIXED, COMPOSITION: 470Ω, 5%, 1/4W	CB4715	01121

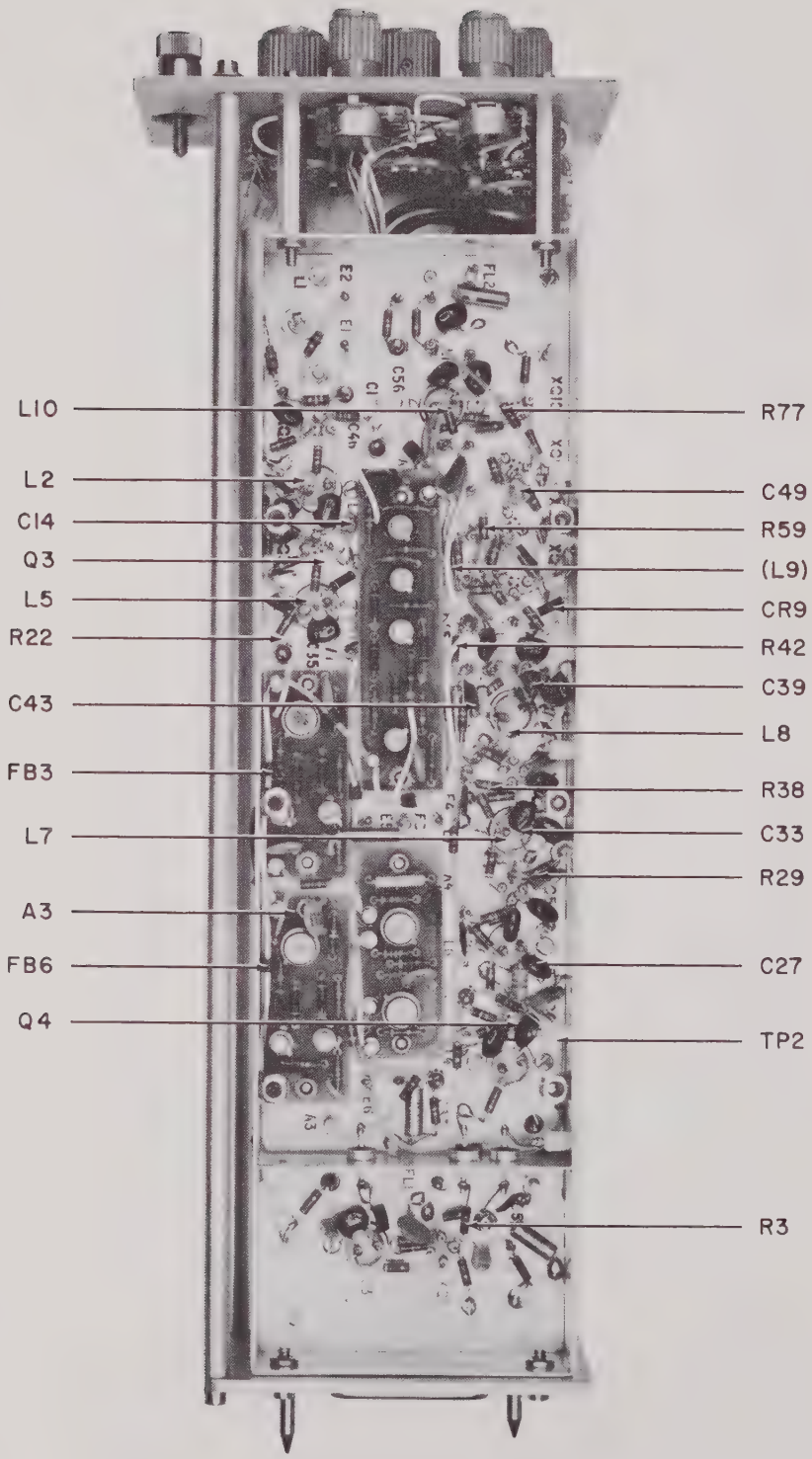

Figure 5-4. Type IFD-15B IF Demodulator, Right Side View

Ref. Desig.	Description	Vendor Part No.	Vendor Code
R23	Same as R7		
R24	RESISTOR, FIXED, COMPOSITION: 2K, 5%, 1/4W	CB2025	01121
R25	Same as R18		
R26	Same as R4		
R27	Same as R20		
R28	RESISTOR, FIXED, COMPOSITION: 2.4K, 5%, 1/4W	CB2425	01121
R29	Same as R5		
R30	Same as R7		
R31	Same as R14		
R32	Same as R24		
R33	RESISTOR, VARIABLE COMPOSITION: 1K, 10%, 1/4W	70-08800	37942
R34	Same as R4		
R35	Same as R20		
R36	RESISTOR, FIXED, COMPOSITION: 150K, 5%, 1/4W	CB1545	01121
R37	RESISTOR, FIXED, COMPOSITION: 750Ω, 5%, 1/4W	CB7515	01121
R38	Same as R3		
R39	Same as R7		
R40	RESISTOR, FIXED, COMPOSITION: 100K, 5%, 1/4W	CB1045	01121
R41	RESISTOR, FIXED, COMPOSITION: 560Ω, 5%, 1/4W	CB5615	01121
R42	Same as R20		
R43	RESISTOR, FIXED, COMPOSITION: 180K, 5%, 1/4W	CB1845	01121
R44	RESISTOR, VARIABLE, COMPOSITION: 10K, 10%, 1/2W	LW23562	71450
R45	NOT USED		
R46	Same as R15		
R47	Same as R4		
R48	NOT USED		
R49	Same as R7		
R50	Same as R5		
R51	Same as R4		
R52	Same as R4		
R53	NOT USED		
R54	Same as R15		
R55	RESISTOR, FIXED, COMPOSITION: 22Ω, 5%, 1/4W	CB2205	01121
R56	NOT USED		
R57	Same as R15		
R58	RESISTOR, FIXED, COMPOSITION: 680Ω, 5%, 1/4W	CB6815	01121

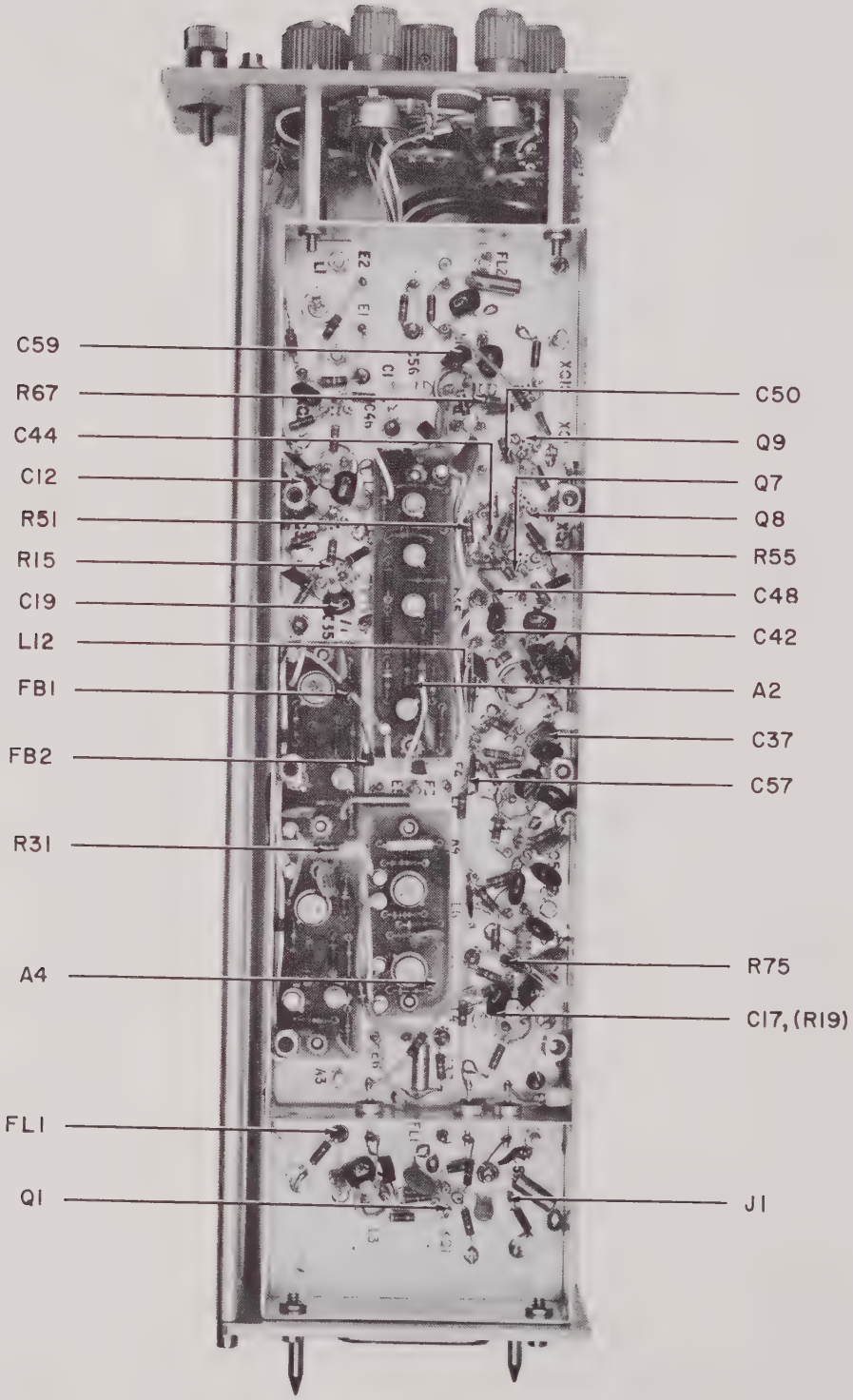

Figure 5-5. Type IFD-15B IF Demodulator, Right Side View

Ref. Desig.	Description	Vendor Part No.	Vendor Code
R59	Same as R7		
R60	Same as R15		
R61	Same as R4		
R62	Same as R11		
R63	RESISTOR, FIXED, COMPOSITION: 150Ω, 5%, 1/4W	CB1515	01121
R64	RESISTOR, FIXED, COMPOSITION: 22K, 5%, 1/4W	CB2235	01121
R65	RESISTOR, FIXED, COMPOSITION: 2.7K, 5%, 1/4W	CB2725	01121
R66	Same as R4		
R67	Same as R15		
R68	Same as R55		
R69	Same as R7		
R70	NOT USED		
R71	NOT USED		
R72	NOT USED		
R73	Same as R5		
R74	Same as R18		
R75	Same as R19		
R76	Same as R19		
R77	Same as R19		
R78	Same as R19		
R79	RESISTOR, FIXED, COMPOSITION: 20K, 5%, 1/4W	CB2035	01121
S1	SWITCH, ROTARY: 3 pole, 3 position	399225A	81716
S2	SWITCH, ROTARY: 1 pole, 3 position	399217A	81716
S3	Same as S2		
TP1	TEST POINT	TJ-6	04013
TP2	Same as TP1		
TP3	Same as TP1		
TP4	Same as TP1		
W1	CABLE AND CONNECTOR ASSEMBLY	30024-118	14632
W2	CABLE AND CONNECTOR ASSEMBLY	30024-119	14632

Figure 5-6. BFO Assembly, Component Locations

5.4.2 Part 10949 Video Amplifier

REF DESIG PREFIXES A1 AND A3

Ref. Desig.	Description	Vendor Part No.	Vendor Code
C1	CAPACITOR, CERAMIC DISC: .005 μf, 20%	SM	91418
C2	Same as C1		
CR1	DIODE	1N462A	07910
CR2	Same as CR1		
Q1	TRANSISTOR	2N697	01295
Q2	TRANSISTOR	2N706	01295
Q3	TRANSISTOR	2N3251	04713
R1	RESISTOR, FIXED, COMPOSITION: 510K, 5%, 1/4W	CB5145	01121
R2	RESISTOR, FIXED, COMPOSITION: 3K, 5%, 1/4W	CB3025	01121
R3	RESISTOR, FIXED, COMPOSITION: 6.2K, 5%, 1/4W	CB6225	01121
R4	RESISTOR, FIXED, COMPOSITION: 6.8Ω, 5%, 1/4W	CB68G5	01121
R5	Same as R4		

REF DESIG PREFIXES A1 & A3

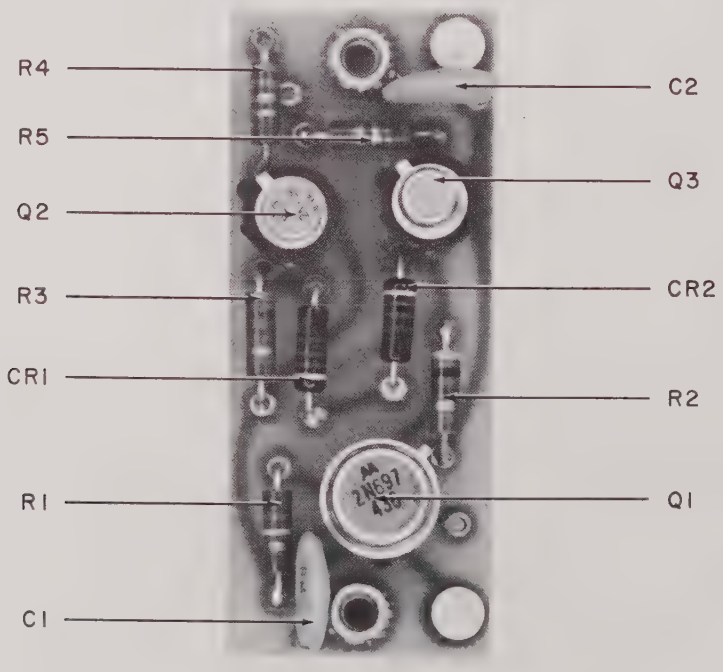

Figure 5-7. Part 10949 Video Amplifier, Component Locations

5.4.3 Part 10967 Video Amplifier

REF DESIG PREFIX A2

Ref. Desig.	Description	Vendor Part No.	Vendor Code
C1	CAPACITOR, CERAMIC DISC: .005 μf, 20%	SM	91418
C2	Same as C1		
CR1	DIODE	1N462A	07910
CR2	Same as CR1		
CR3	Same as CR1		
Q1	TRANSISTOR	2N3251	04713
Q2	TRANSISTOR	2N706	01295
Q3	Same as Q1		
Q4	Same as Q2		
R1	RESISTOR, FIXED, COMPOSITION: 3M, 5%, 1/4W	CB1055	01121
R2	RESISTOR, FIXED, COMPOSITION: 100K, 5%, 1/4W	CB1045	01121
R3	RESISTOR, FIXED, COMPOSITION: 1.1K, 5%, 1/4W	CB1125	01121
R4	RESISTOR, FIXED, COMPOSITION: 11K, 5%, 1/4W	CB1135	01121
R5	RESISTOR, FIXED, COMPOSITION: 27Ω, 5%, 1/4W	CB2705	01121
R6	RESISTOR, FIXED, COMPOSITION: 3.9K, 5%, 1/4W	CB3925	01121
R7	RESISTOR, FIXED, COMPOSITION: 20Ω, 5%, 1/4W	CB2005	01121
R8	Same as R7		
R9	RESISTOR, FIXED, COMPOSITION: 620Ω, 5%, 1/4W	CB6215	01121
R10	RESISTOR, FIXED, COMPOSITION: 680Ω, 5%, 1/4W	CB6815	01121

REF DESIG PREFIX A2

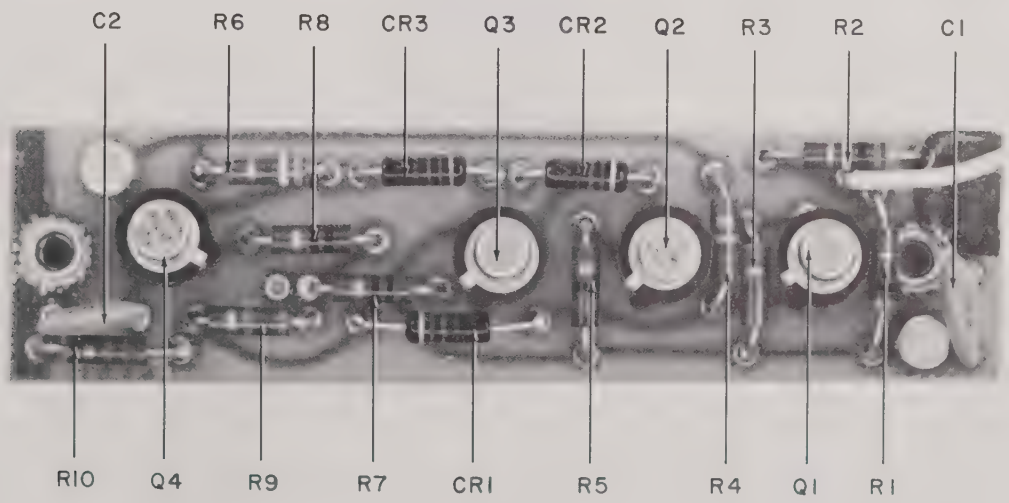

Figure 5-8. Part 10967 Video Amplifier, Component Locations

5.4.4 Part 10383 AGC Amplifier

REF DESIG PREFIX A4

Ref. Desig.	Description	Vendor Part No.	Vendor Code
C1	CAPACITOR, ELECTROLYTIC: 3.3 μf, 10%, 35V	150D335X9035B2	56289
C2	CAPACITOR, CERAMIC DISC: .005 μf, 20%	SM	91418
Q1	TRANSISTOR	2N697	01295
Q2	Same as Q1		
R1	RESISTOR, FIXED, COMPOSITION: 30K, 5%, 1/4W	CB3035	01121
R2	RESISTOR, FIXED, COMPOSITION: 33K, 5%, 1/4W	CB3335	01121
R3	RESISTOR, FIXED, COMPOSITION 470Ω, 5%, 1/4W	CB4715	01121
R4	RESISTOR, FIXED, COMPOSITION: 18K, 5%, 1/4W	CB1835	01121
R5	RESISTOR, FIXED, COMPOSITION: 47Ω, 5%, 1/4W	CB4705	01121

REF DESIG PREFIX A4

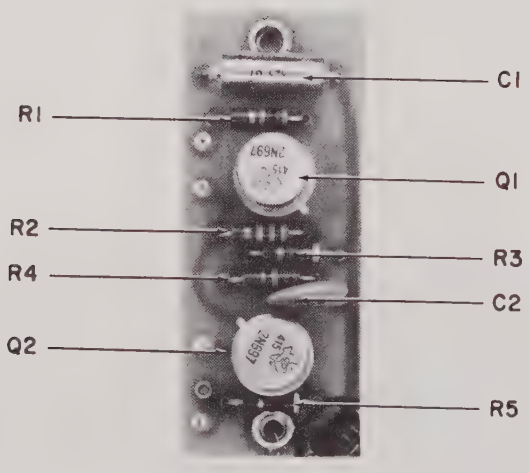

Figure 5-9. Part 10383 AGC Amplifier, Component Locations

SECTION VI

SCHEMATICS

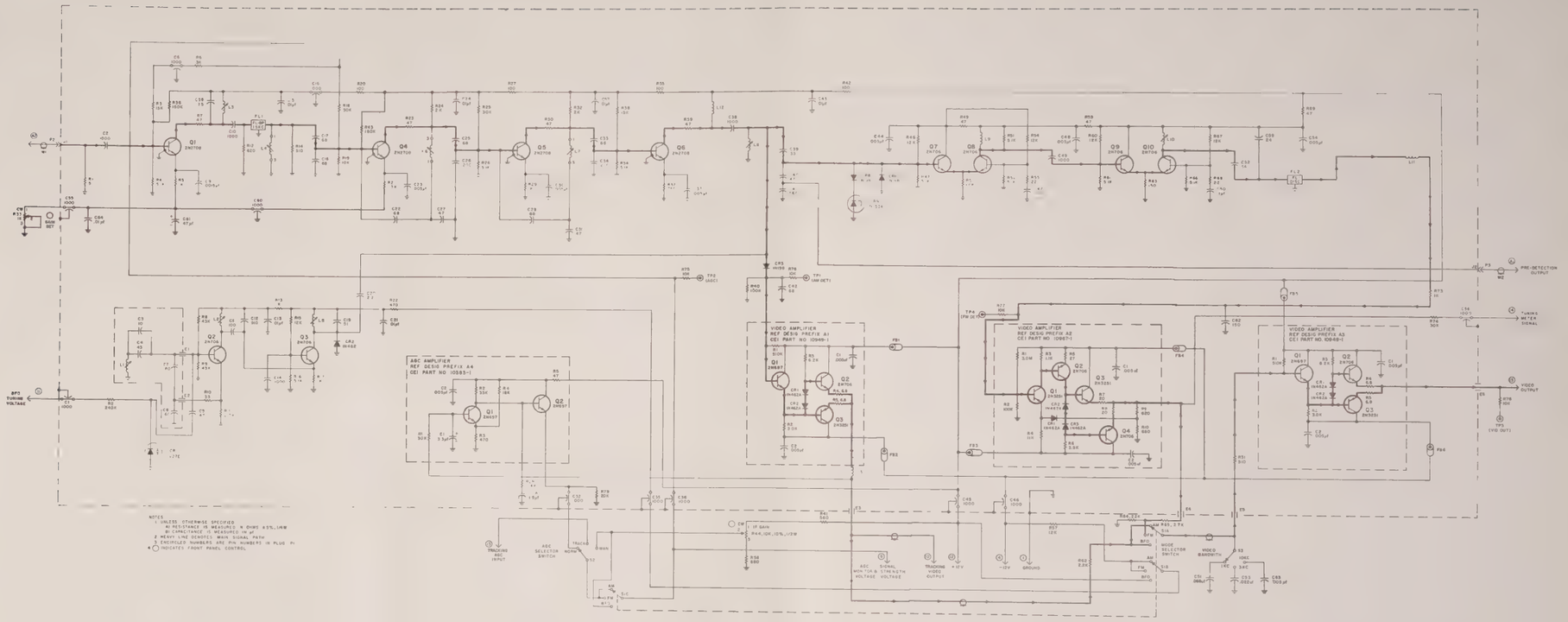

Figure 6-1. Type IFD-15B IF Demodulator, Schematic Diagram

IDENTIFICATION TABLE OF PARTS FOR IFD15B

CONTRACTOR: LTV ELECTROSYSTEMS, INC.
CONTRACT NO.: DA18-119AMC01357X

REF. SYM. OR PART NUMBER (1)	NAME OF PARTS AND DESCRIPTION (2)	FUNCTION (3)	ALL SYMBOLS AND PART NUMBERS INVOLVED (4)	JAN OR MIL TYPE NUMBER (5)	EQUIPMENT REPAIR PART KIT QUANTITIES PER SERVICE (6) ARMY	AF	NAVY	MARINE	OTHER	FEDERAL STOCK NUMBER (7)	TOTAL NUMBER PARTS PER END ITEM (8)
FIG. NO. 5-1	DEMODULATOR, IF **COMMUNICATION ELECTRONICS, INC PART NO. IFD15B	PROVIDES RECEPTION OF AM,FM, AND CW SIGNALS FROM A 21.4 MC IF SIGNAL INPUT									
A1	AMPLIFIER, VIDEO **COMMUNICATION ELECTRONICS, INC PART NO. 10949-1	CIRCUITRY FOR VIDEO AMPLIFIER	A1, A3,								0002
A2	AMPLIFIER, VIDEO **COMMUNICATION ELECTRONICS, INC PART NO. 10967-1	CIRCUITRY FOR VIDEO AMPLIFIER	A2,								0001
A3	SAME AS A1	CIRCUITRY FOR VIDEO AMPLIFIER									
A4	AMPLIFIER, AGC **COMMUNICATIONS ELECTRONICS,INC PART NO. 10383-1	CIRCUITRY FOR AGC AMPLIFIER	A4,								0001
C1	CAPACITOR, FIXED, CERAMIC DIELECTRIC- 500 VDC, 1000 PF, **ALLEN-BRADLEY CO. PART NO. FA5C102W	FILTER	C1, C6, C16, C32, C35, C36, C45, C46, C55, C56, C60,							59108027432	0011
C2	CAPACITOR, FIXED, CERAMIC DIELECTRIC- 500 VDC, 1000 PF, GMV **RADIO MATERIALS CORP. PART NO. SM1000PFGMV	COUPLING TO Q1	C2, C10, C14, C38, C47, C49,							59108997745	0006
C3	CAPACITOR, FIXED, CERAMIC PORM 0.5 PF **ERIE TECHNOLOGICAL PRODUCTS INC., PART NO. 301-000U2J0100D500V	TUNING FOR 10.7MC	C3,								0001
C4	CAPACITOR, FIXED, MICA 5 PCT **ELECTRO MOTIVE MFG CO., PART NO. DM10F430JP500WV4CR	TUNING FOR 10.7MC	C4,								0001
C5	CAPACITOR, FIXED, MICA DIELECTRIC- 500 VDC, 47 PF, PORM 5 PCT **ELECTRO MOTIVE MFG CO., PART NO. DM10F470JP500WV4CR	SHUNT ACROSS BASE TUNED CIRCUIT OF Q2	C5, C27, C31, C40,								0004
C6	SAME AS C1	FILTER WITH R6									
C7	CAPACITOR, FIXED, MICA DIELECTRIC- 500 VDC, 180 PF, PORM 5 PCT **ELECTRO MOTIVE MFG CO., PART NO. DM10F181JP500WV4CR	TUNING WITH L1	C7,								0001
C8	CAPACITOR, FIXED, MICA DIELECTRIC- 500 VDC, 160 PF, PORM 5 PCT **ELECTRO MOTIVE MFG CO., PART NO. DM10F161JP500WV4CR	FEEDBACK	C8,								0001
C9	CAPACITOR, FIXED, CERAMIC DIELECTRIC- 500 VDC, 0.0015 UF, PORM 10 PCT **CENTRALAB DIVISION OF GLOBE-UNION, INC PART NO. ID152	FILTER	C9,								0001
C10	SAME AS C2	COUPLING BETWEEN Q AND FL1									
C11	CAPACITOR, FIXED, MICA DIELECTRIC- 500 VDC, 100 PF, PORM 5 PCT **ELECTRO MOTIVE MFG CO., PART NO. DM10F101JP500WV4CR	COUPLING BETWEEN Q2 AND Q3	C11,							59107716868	0001
C12	CAPACITOR, FIXED, MICA DIELECTRIC- 100 VDC, 910 PF, PORM 5 PCT **ELECTRO MOTIVE MFG CO., PART NO. DM15F911JP100WV4CR	TUNING FOR 21.4MC	C12,							59108524047	0001
C13	CAPACITOR, FIXED, CERAMIC DIELECTRIC- 200 VDC, 10000 PF, PORM 20 PCT **ERIE TECHNOLOGICAL PRODUCTS INC., PART NO. 4835-000Z5U0103M200V	FILTER	C13, C15, C21, C24, C43, C57, C64,								0007
C14	SAME AS C2	FILTER									
C15	SAME AS C13	FILTER									
C16	SAME AS C1	FILTER									
C17	CAPACITOR, FIXED, MICA DIELECTRIC- 500 VDC, 68 PF,	COUPLING BETWEEN FL1 AND Q4	C17, C18, C25, C33, C42,								0005

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IDENTIFICATION TABLE OF PARTS FOR IF0158

CONTRACTOR: LTV ELECTROSYSTEMS, INC.
CONTRACT NO.: DA18-119AMC01357X

REF. SYM. OR PART NUMBER (1)	NAME OF PARTS AND DESCRIPTION (2)	FUNCTION (3)	ALL SYMBOLS AND PART NUMBERS INVOLVED (4)	JAN OR MIL TYPE NUMBER (5)	EQUIPMENT REPAIR PART KIT QUANTITIES PER SERVICE (6) ARMY	AF	NSA	NAVY	OTHER	FEDERAL STOCK NUMBER (7)	TOTAL NUMBER PARTS PER END ITEM (8)
C49	SAME AS C2	COUPLING BETWEEN Q8 AND Q9									
C50	CAPACITOR, FIXED, CERAMIC DIELECTRIC- 10 VDC, 0.1 UF, PLUS 80 MINUS 20 PCT **CENTRALAB DIVISION OF GLOBE-UNION, INC. PART NO. UK10-104	FILTER WITH R68	C50,							59102257329	0001
C51	CAPACITOR, FIXED, PLASTIC DIELECTRIC- 0.063 UF, PORM 10PCT **TRW CAPACITOR DIV. PART NO. 663UW68391W2	FILTER	C51,								0001
C52	CAPACITOR, FIXED, MICA DIELECTRIC- 500 VDC, 56 PF, PORM 5 PCT **ELECTRO MOTIVE MFG CO., PART NO. DM10F560JP500WV4CR	COUPLING BETWEEN Q10 AND FL2	C52,								0001
C53		FILTER	C53,							59108894651	0001
C54	SAME AS C23	FILTER									
C55	SAME AS C1	FILTER									
C56	SAME AS C1	FILTER									
C57	SAME AS C13	FILTER									
C58	CAPACITOR, FIXED, MICA DIELECTRIC- 500 VDC, 15 PF, PORM 5 PCT **ELECTRO MOTIVE MFG. CO. PART NO. DM10F150JP500WV4CR	TUNING WITH L3	C58,								0001
C59	CAPACITOR, FIXED, MICA DIELECTRIC- 500 VDC, 24 PF, PORM 5 PCT **ELECTRO MOTIVE MFG CO., PART NO. DM10F240JP500WV4CR	TUNING WITH L10	C59,								0001
C60	SAME AS C1	FILTER									
C61	CAPACITOR, FIXED, ELECTROLYTIC- 6 VDC, 47 UF, PORM 10 PCT **SPRAGUE ELECTRIC CO., PART NO. 150D476X9006B2	FILTER	C61,							59108512092	0001
C62	CAPACITOR, FIXED, MICA DIELECTRIC- 500 VDC, 150 PF, PORM 5 PCT **ELECTRO MOTIVE MFG CO., PART NO. DM10F151JP500WV4CR	FILTER	C62,								0001
C63	SAME AS C23	FILTER									
C64	SAME AS C13	FILTER									
CR1	SEMICONDUCTOR DEVICE, DIODE-SILICON, VARICAP **TRW SEMICONDUCTORS PART NO. V27E	VARIABLE CAPACITOR	CR1,								0001
CR2	SEMICONDUCTOR DEVICE, DIODE- **TRW ELECTRONICS, THOMPSON RAMO WOOLDRIDGE, INC. PART NO. 1N462A	CLAMP	CR2,								0001
CR3	SEMICONDUCTOR DEVICE, DIODE-SILICON	DETECTOR	CR3, CR8, CR10,	MIL-S-19500 1N198						59607545852	0003
CR8	SAME AS CR3	CLAMP									
CR9	SEMICONDUCTOR DEVICE, DIODE-SILICON	LIMITER	CR9,	MIL-S-19500 1N753A							0001
CR10	SAME AS CR3	CLAMP									
E1	INSULATOR-FEEDTHRU **TAURUS CORP. PART NO. SFU16	INSULATOR	E1, E2, E3, E4, E5, E6,								0006
E2	SAME AS E1	INSULATOR									
E3	SAME AS E1	INSULATOR									
E4	SAME AS E1	INSULATOR									
E5	SAME AS E1	INSULATOR									
E6	SAME AS E1	INSULATOR									
FB1	SHIELDING BEADS, ELECTRICAL AND MAGNETIC, PERMEABILITY 600UOHMS AT 20 DEG. C. **FERROXCUBE CORP. OF AMERICA PART NO. 56-590-65-4A	FILTER	FB1, FB2, FB3, FB4, FB5, FB6,								0006

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IDENTIFICATION TABLE OF PARTS FOR IFD158

CONTRACTOR: LTV ELECTROSYSTEMS, INC.
CONTRACT NO.: DA18-119AMC01357X

REF. SYM. OR PART NUMBER (1)	NAME OF PARTS AND DESCRIPTION (2)	FUNCTION (3)	ALL SYMBOLS AND PART NUMBERS INVOLVED (4)	JAN OR MIL TYPE NUMBER (5)	EQUIPMENT REPAIR PART KIT QUANTITIES PER SERVICE (6) ARMY	AF	NAVY	OTHER	FEDERAL STOCK NUMBER (7)	TOTAL NUMBER PARTS PER END ITEM (8)
FB2	SAME AS FB1	FILTER								
FB3	SAME AS FB1	FILTER								
FB4	SAME AS FB1	FILTER								
FB5	SAME AS FB1	FILTER								
FB6	SAME AS FB1	FILTER								
FL1	FILTER, CRYSTAL- 15 KC **BARDCO MFG. AND SALES CO. PART NO. DR5	BANDPASS FILTER	FL1,							0001
FL2	FILTER, DISCRIMINATOR- 15 KC **BARDCO MFG. AND SALES CO. PART NO. AR6	DISCRIMINATOR	FL2,							0001
J1	CONNECTOR, RECEPTACLE, ELECTRICAL- **AMPHENOL FXR DIVISION PART NO. 27-9	21.4MC INPUT CONNECTOR	J1, J2,							0002
J2	SAME AS J1	PRE-DETECTION OUTPUT CONNECTOR								
L1	COIL, RADIO FREQUENCY- **COMMUNICATION ELECTRONICS, INC PART NO. 1113	TUNING FOR 10.7MC	L1,							0001
L2	COIL, RADIO FREQUENCY- VARIABLE **COMMUNICATION ELECTRONICS, INC PART NO. 1472-1	TUNING FOR 21.4MC	L2,							0001
L3	COIL, RADIO FREQUENCY- VARIABLE **COMMUNICATION ELECTRONICS INC. PART NO. 1472-4	TUNING WITH C58	L3,							0001
L4	COIL, RADIO FREQUENCY- VARIABLE **COMMUNICATION ELECTRONICS INC. PART NO. 1472-3	TUNING WITH R14	L4, L6, L7, L8, L10,							0005
L5	COIL, RADIO FREQUENCY- VARIABLE **COMMUNICATION ELECTRONICS, INC PART NO. 1472-2	TUNING WITH C19	L5,							0001
L6	SAME AS L4	PULSE SHAPING								
L7	SAME AS L4	PULSE SHAPING								
L8	SAME AS L4	PULSE SHAPING								
L9	COIL, RADIO FREQUENCY- FIXED **COMMUNICATION ELECTRONICS INC. PART NO. 1131-41	FILTER	L9,							0001
L10	SAME AS L4	PULSE SHAPING								
L11	COIL, RADIO FREQUENCY- FIXED **COMMUNICATION ELECTRONICS, INC PART NO. 1131-37	FILTER	L11, L12, L13,							0003
L12	SAME AS L11	FILTER								
L13	SAME AS L11	FILTER								
Q1	TRANSISTOR- SILICON	IF AMPLIFIER	Q1, Q4, Q5, Q6,	MIL-T-19500 2N2708						0004
Q2	TRANSISTOR- SILICON	OSCILLATOR	Q2, Q3, Q7, Q8, Q9, Q10,	MIL-T-19500 2N706					5960 8248448	0006
Q3	SAME AS Q2	AMPLIFIER								
Q4	SAME AS Q1	IF AMPLIFIER								
Q5	SAME AS Q1	IF AMPLIFIER								
Q6	SAME AS Q1	IF AMPLIFIER								
Q7	SAME AS Q2	LIMITER								
Q8	SAME AS Q2	LIMITER								
Q9	SAME AS Q2	LIMITER								
Q10	SAME AS Q2	LIMITER								
R1	RESISTOR, FIXED, COMPOSITION- 51 OHMS, PORM 5 PCT, 1/4 WATT	IMPEDANCE MATCHING	R1,	MIL-R-11 RC07GF510J					59056837720	0001
R2	RESISTOR, FIXED, COMPOSITION- 240K OHMS, PORM 5 PCT, 1/4 WATT	PARASITIC SUPPRESSOR	R2,	MIL-R-11 RC07GF244J					59056818820	0001

FOR OFFICIAL USE ONLY

IDENTIFICATION TABLE OF PARTS FOR IFD15B

CONTRACTOR LTV ELECTROSYSTEMS, INC. CONTRACT NO DA18-119AMC01357X

REF. SYM. OR PART NUMBER (1)	NAME OF PARTS AND DESCRIPTION (2)	FUNCTION (3)	ALL SYMBOLS AND PART NUMBERS INVOLVED (4)	JAN OR MIL TYPE NUMBER (5)	EQUIPMENT REPAIR PART KIT QUANTITIES PER SERVICE (6) ARMY	AF	NA	NAVY	OTHER	FEDERAL STOCK NUMBER (7)	TOTAL NUMBER PARTS PER END ITEM (8)
R3	RESISTOR, FIXED, COMPOSITION-15000 OHMS, PORM 5 PCT, 1/4 WATT	VOLTAGE DROPPING	R3, R38,	MIL-R-11 RC07GF153J						59056918818	0002
R4	RESISTOR, FIXED, COMPOSITION-5100 OHMS, PORM 5 PCT, 1/4 WATT	BASE BIAS FOR Q1	R4, R16, R26, R34, R47, R51, R52, R61, R66,	MIL-R-11 RC07GF512J						59056832241	0009
R5	RESISTOR, FIXED, COMPOSITION-1000 OHMS, PORM 5 PCT, 1/4 WATT	EMITTER BIAS FOR Q1	R5, R13, R17, R29, R50, R73,	MIL-R-11 RC07GF102J						59056816462	0006
R6	RESISTOR, FIXED, COMPOSITION-3000 OHMS, PORM 5 PCT, 1/4 WATT	FILTER WITH C6	R6, R21,	MIL-R-11 RC07GF302J						59056824097	0002
R7	RESISTOR, FIXED, COMPOSITION-47 OHMS, PORM 5 PCT, 1/4 WATT	PARASITIC SUPPRESSOR	R7, R23, R30, R39, R49, R59, R69,	MIL-R-11 RC07GF470J						59058026730	0007
R8	RESISTOR, FIXED, COMPOSITION-43000 OHMS, PORM 5 PCT, 1/4 WATT	BASE BIAS FOR Q2	R8, R9,	MIL-R-11 RC07GF433J						59058070059	0002
R9	SAME AS R8	BASE BIAS FOR Q2									
R10	RESISTOR, FIXED, COMPOSITION-33 OHMS, PORM 5 PCT, 1/4 WATT	PARASITIC SUPPRESSOR	R10,	MIL-R-11 RC07GF330J						59058060636	0001
R11	RESISTOR, FIXED, COMPOSITION-2200 OHMS, PORM 5 PCT, 1/4 WATT	EMITTER BIAS FOR Q2	R11, R62,	MIL-R-11 RC07GF222J						59055779596	0002
R12	RESISTOR, FIXED, COMPOSITION-620 OHMS, PORM 5 PCT, 1/4 WATT	IMPEDANCE MATCHING	R12,	MIL-R-11 RC07GF621J						59058016998	0001
R13	SAME AS R5	PARASITIC SUPPRESSOR									
R14	RESISTOR, FIXED, COMPOSITION-510 OHMS, PORM 5 PCT, 1/4 WATT	IMPEDANCE MATCHING	R14, R31,	MIL-R-11 RC07GF511J						59058018272	0002
R15	RESISTOR, FIXED, COMPOSITION-12000 OHMS, PORM 5 PCT, 1/4 WATT	BASE BIAS FOR Q3	R15, R46, R54, R57, R60, R67,	MIL-R-11 RC07GF123J						59057264413	0006
R16	SAME AS R4	BASE BIAS FOR Q3									
R17	SAME AS R5	EMITTER BIAS FOR Q3									
R18	RESISTOR, FIXED, COMPOSITION-30000 OHMS, PORM 5 PCT, 1/4 WATT	BASE BIAS FOR Q4	R18, R25,	MIL-R-11 RC07GF303J						59058032908	0002
R19	RESISTOR, FIXED, COMPOSITION-10000 OHMS, PORM 5 PCT, 1/4 WATT	BASE BIAS FOR Q4	R19, R75, R76, R77, R78,	MIL-R-11 RC07GF103J						59055682238	0005
R20	RESISTOR, FIXED, COMPOSITION-100 OHMS, PORM 5 PCT, 1/4 WATT	PARASITIC SUPPRESSOR	R20, R27, R35, R42,	MIL-R-11 RC07GF101J						59056837721	0004
R21	SAME AS R6	EMITTER BIAS FOR Q4									
R22	RESISTOR, FIXED, COMPOSITION-470 OHMS, PORM 5 PCT, 1/4 WATT	FILTER WITH C21	R22,	MIL-R-11 RC07GF471J						59056832242	0001
R23	SAME AS R7	PARASITIC SUPPRESSOR									
R24	RESISTOR, FIXED, COMPOSITION-2000 OHMS, PORM 5 PCT, 1/4 WATT	CURRENT LIMITER	R24, R32,	MIL-R-11 RC07GF202J						59056863370	0002
R25	SAME AS R18	BASE BIAS FOR Q5									
R26	SAME AS R4	BASE BIAS FOR Q5									
R27	SAME AS R20	PARASITIC SUPPRESSOR									
R28	RESISTOR, FIXED, COMPOSITION-2400 OHMS, PORM 5 PCT, 1/4 WATT	FILTER WITH C28	R28,	MIL-R-11 RC07GF242J						59056837724	0001
R29	SAME AS R5	EMITTER BIAS FOR Q5									
R30	SAME AS R7	PARASITIC SUPPRESSOR									
R31	SAME AS R14	COUPLING									
R32	SAME AS R24	CURRENT LIMITER									
R33	RESISTOR, VARIABLE- 1K OHMS, PORM 10 PCT, 1/4 WATT **MALLORY, PR AND CO., INC PART NO. 70-08800	GAIN SET CONTROL	R33,								0001
R34	SAME AS R4	BASE BIAS FOR Q6									
R35	SAME AS R20	PARASITIC SUPPRESSOR									
R36	RESISTOR, FIXED, COMPOSITION-150K OHMS, PORM 5 PCT, 1/4 WATT	VOLTAGE DIVIDING	R36,	MIL-R-11 RC07GF154J						59056869995	0001
R37	RESISTOR, FIXED, COMPOSITION-750 OHMS, PORM 5 PCT, 1/4 WATT	EMITTER BIAS FOR Q6	R37,	MIL-R-11 RC07GF751J						59058074954	0001
R38	SAME AS R3	BASE BIAS FOR Q6									
R39	SAME AS R7	PARASITIC SUPPRESSOR									
R40	RESISTOR, FIXED, COMPOSITION-100K OHMS, PORM 5 PCT, 1/4 WATT	LOAD FOR CR3	R40,	MIL-R-11 RC07GF104J						59056863129	0001

FOR OFFICIAL USE ONLY

IDENTIFICATION TABLE OF PARTS FOR IFD15B

CONTRACTOR LTV ELECTROSYSTEMS, INC.

CONTRACT NO DA18-119AMC01357X

REF. SYM. OR PART NUMBER (1)	NAME OF PARTS AND DESCRIPTION (2)	FUNCTION (3)	ALL SYMBOLS AND PART NUMBERS INVOLVED (4)	JAN OR MIL TYPE NUMBER (5)	EQUIPMENT REPAIR PART KIT QUANTITIES PER SERVICE (6) ARMY	AF	NAVY	NAVY	OTHER	FEDERAL STOCK NUMBER (7)	TOTAL NUMBER PARTS PER END ITEM (8)
R41	RESISTOR, FIXED, COMPOSITION-560 OHMS, PORM 5 PCT, 1/4 WATT	VOLTAGE DROPPING	R41,	MIL-R-11 RC07GF561J						59056824109	0001
R42	SAME AS R20	PARASITIC SUPPRESSOR									
R43	RESISTOR, FIXED, COMPOSITION-180K OHMS, PORM 5 PCT, 1/4 WATT	BASE BIAS FOR Q4	R43,	MIL-R-11 RC07GF184J						59056818819	0001
R44	RESISTOR, VARIABLE- 10K OHMS, PORM 10 PCT, 1/2 WATT **CTS CORP PART NO. LW23562	IF GAIN CONTROL	R44,								0001
R46	SAME AS R15	BASE BIAS FOR Q7									
R47	SAME AS R4	BASE BIAS FOR Q7									
R49	SAME AS R7	PARASITIC SUPPRESSOR									
R50	SAME AS R5	EMITTER LOAD FOR Q7									
R51	SAME AS R4	COLLECTOR LOAD FOR Q8									
R52	SAME AS R4	BASE BIAS FOR Q8									
R54	SAME AS R15	BASE BIAS FOR Q8									
R55	RESISTOR, FIXED, COMPOSITION-22 OHMS, PORM 5 PCT, 1/4 WATT	FILTER WITH C47	R55, R68,	MIL-R-11 RC07GF220J						59057558389	0002
R57	SAME AS R15	VOLTAGE DROPPING									
R58	RESISTOR, FIXED, COMPOSITION-680 OHMS, PORM 5 PCT, 1/4 WATT	VOLTAGE DROPPING	R58,	MIL-R-11 RC07GF681J						59057278001	0001
R59	SAME AS R7	PARASITIC SUPPRESSOR									
R60	SAME AS R15	BASE BIAS FOR Q9									
R61	SAME AS R4	BASE BIAS FOR Q9									
R62	SAME AS R11	FILTER WITH C51,C53 AND C63									
R63	RESISTOR, FIXED, COMPOSITION-150 OHMS, PORM 5 PCT, 1/4 WATT	EMITTER LOAD FOR Q9	R63,	MIL-R-11 RC07GF151J						59056832243	0001
R64	RESISTOR, FIXED, COMPOSITION-22000 OHMS, PORM 5 PCT, 1/4 WATT	VOLTAGE DROPPING	R64,	MIL-R-11 RC07GF223J						59056870002	0001
R65	RESISTOR, FIXED, COMPOSITION-2700 OHMS, PORM 5 PCT, 1/4 WATT	FILTER WITH C51,C53 AND C63	R65,	MIL-R-11 RC07GF272J						59056863798	0001
R66	SAME AS R4	BASE BIAS FOR Q10									
R67	SAME AS R15	BASE BIAS FOR Q10									
R68	SAME AS R55	FILTER WITH C50									
R69	SAME AS R7	PARASITIC SUPPRESSOR									
R73	SAME AS R5	PARASITIC SUPPRESSOR									
R75	SAME AS R19	CURRENT LIMITER									
R76	SAME AS R19	CURRENT LIMITER									
R77	SAME AS R19	CURRENT LIMITER									
R78	SAME AS R19	CURRENT LIMITER									
R79	RESISTOR, FIXED, COMPOSITION-20000 OHMS, PORM 5 PCT, 1/4 WATT	EMITTER LOAD FOR A4Q2	R79,	MIL-R-11 RC07GF203J						59056863368	0001
S1A,B,C,	SWITCH, ROTARY, 2 SECTIONS, 24 POSITIONS, 4 POLES, 6 THROWS **OAK MFG. CO. PART NO. 399225A	MODE SELECT SWITCH	S1A,B,C,,								0001
S2	SWITCH, ROTARY, 1 SECTION, 12 POSITIONS, 1 POLE, 12 THROWS **OAK MFG. CO. PART NO. 399217A	AGC SELECTOR SWITCH	S2, S3,								0002
S3	SAME AS S2	VIDEO BANDWIDTH SWITCH									
TP1	TEST POINT- **TAURUS CORP. PART NO. TJ6	AM DETECTOR OUTPUT TEST POINT	TP1, TP2, TP3, TP4,							59352260489	0004
TP2	SAME AS TP1	AGC TEST POINT									
TP3	SAME AS TP1	VIDEO OUTPUT TEST POINT									

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IDENTIFICATION TABLE OF PARTS FOR IFD15B

CONTRACTOR: LTV ELECTROSYSTEMS, INC.

CONTRACT NO: DA18-119AMC01357X

REF. SYM. OR PART NUMBER (1)	NAME OF PARTS AND DESCRIPTION (2)	FUNCTION (3)	ALL SYMBOLS AND PART NUMBERS INVOLVED (4)	JAN OR MIL TYPE NUMBER (5)	EQUIPMENT REPAIR PART KIT QUANTITIES PER SERVICE (6) ARMY	AF	NA	NAVY	OTHER	FEDERAL STOCK NUMBER (7)	TOTAL NUMBER PARTS PER END ITEM (8)
TP4	SAME AS TP1	FM DETECTOR TEST POINT									
W1	CABLE ASSEMBLY, RADIO FREQUENCY-CABLE AND CONNECTOR ASSEMBLY **COMMUNICATION ELECTRONICS, INC PART NO. 30020-118	IF INPUT CABLE	W1,								0001
W2	CABLE ASSEMBLY, RADIO FREQUENCY-CABLE AND CONNECTOR ASSEMBLY **COMMUNICATION ELECTRONICS, INC PART NO. 30020-119	PRE-DETECTION OUTPUT CABLE	W2,								0001

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FIG. NO. 5-7	AMPLIFIER, VIDEO- **COMMUNICATION ELECTRONICS, INC PART NO. 10949-1	AMPLIFIES VIDEO SIGNALS									
C1	CAPACITOR, FIXED, CERAMIC DIELECTRIC- 500 VDC, 5000 PF, PORM 20 PCT **RADIO MATERIALS CORP. PART NO. SM5000PFPORM20PCT	FILTER	C1, C2,								0002
C2	SAME AS C1	FILTER WITH R2									
CR1	SEMICONDUCTOR DEVICE, DIODE- SILICON **TRW ELECTRONICS, THOMPSON RAMO WOOLDRIDGE, INC. PART NO. 1N462A	DC LEVEL COMPENSATOR WITH CR2	CR1, CR2,								0002
CR2	SAME AS CR1	DC LEVEL COMPENSATOR WITH CR1									
Q1	TRANSISTOR- SILICON	EMITTER FOLLOWER	Q1,	MIL-T-19500 2N697						5960837015 0	0001
Q2	TRANSISTOR- SILICON	EMITTER FOLLOWER	Q2,	MIL-T-19500 2N706						5960824844 8	0001
Q3	TRANSISTOR- SILICON	EMITTER FOLLOWER	Q3,	MIL-T-19500 2N3251							0001
R1	RESISTOR, FIXED, COMPOSITION- 510K OHMS, PORM 5 PCT, 1/4 WATT	VOLTAGE DROPPING	R1,	MIL-R-11 RC07GF514J						5905681885 6	0001
R2	RESISTOR, FIXED, COMPOSITION- 3000 OHMS, PORM 5 PCT, 1/4 WATT	FILTER WITH C2	R2,	MIL-R-11 RC07GF302J						5905682409 7	0001
R3	RESISTOR, FIXED, COMPOSITION- 6200 OHMS, PORM 5 PCT, 1/4 WATT	VOLTAGE DROPPING	R3,	MIL-R-11 RC07GF622J						5905682410 0	0001
R4	RESISTOR, FIXED, COMPOSITION- 6.8 OHMS, PORM 5 PCT, 1/4 WATT	CURRENT LIMITER	R4, R5,	MIL-R-11 RC07GF6R8J						5905726543 7	0002
R5	SAME AS R4	CURRENT LIMITER									

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IDENTIFICATION TABLE OF PARTS FOR IFD158

CONTRACTOR: LTV ELECTROSYSTEMS, INC.

CONTRACT NO.: DA18-119AMC01357X

REF. SYM. OR PART NUMBER (1)	NAME OF PARTS AND DESCRIPTION (2)	FUNCTION (3)	ALL SYMBOLS AND PART NUMBERS INVOLVED (4)	JAN OR MIL TYPE NUMBER (5)	EQUIPMENT REPAIR PART KIT QUANTITIES PER SERVICE (6) ARMY	AF	NSA	NAVY	OTHER	FEDERAL STOCK NUMBER (7)	TOTAL NUMBER PARTS PER END ITEM (8)
FIG. NO. 5-8	AMPLIFIER, VIDEO- **COMMUNICATION ELECTRONICS, INC PART NO. 10967-1	AMPLIFIES FM DISCRIMINATOR VIDEO SIGNAL									
C1	CAPACITOR, FIXED, CERAMIC DIELECTRIC- 50C VDC, 5000 PF, PORM 20 PCT **RADIO MATERIALS CORP. PART NO. SM50000PFPORM20PCT	FILTER	C1, C2,								0002
C2	SAME AS C1	FILTER									
CR1	SEMICONDUCTOR DEVICE, DIODE- **TRW ELECTRONICS, THOMPSON RAMO WOOLDRIDGE, INC. PART NO. 1N462A	DC LEVEL COMPENSATOR	CR1, CR2, CR3,								0003
CR2	SAME AS CR1	DC LEVEL COMPENSATOR WITH CR3									
CR3	SAME AS CR1	DC LEVEL COMPENSATOR WITH CR2									
Q1	TRANSISTOR- SILICON	AMPLIFIER	Q1, Q3,	MIL-T-19500 2N3251							0002
Q2	TRANSISTOR- SILICON	AMPLIFIER	Q2, Q4,	MIL-T-19500 2N706						59608248448	0002
Q3	SAME AS Q1	EMITTER FOLLOWER									
Q4	SAME AS Q2	EMITTER FOLLOWER									
R1	RESISTOR, FIXED, COMPOSITION- 1.0 MEG OHMS, PORM 5 PCT, 1/4 WATT	VOLTAGE DIVIDING	R1,	MIL-R-11 RC07GF105J						59056818817	0001
R2	RESISTOR, FIXED, COMPOSITION- 100K OHMS, PORM 5 PCT, 1/4 WATT	VOLTAGE DIVIDING	R2,	MIL-R-11 RC07GF104J						59056863129	0001
R3	RESISTOR, FIXED, COMPOSITION- 1100 OHMS, PORM 5 PCT, 1/4 WATT	VOLTAGE DROPPING	R3,	MIL-R-11 RC07GF112J						59058008063	0001
R4	RESISTOR, FIXED, COMPOSITION- 11000 OHMS, PORM 5 PCT, 1/4 WATT	EMITTER BIAS FOR Q1	R4,	MIL-R-11 RC07GF113J						59056863128	0001
R5	RESISTOR, FIXED, COMPOSITION- 27 OHMS, PORM 5 PCT, 1/4 WATT	EMITTER BIAS FOR Q2	R5,	MIL-R-11 RC07GF270J						59058086135	0001
R6	RESISTOR, FIXED, COMPOSITION-	BASE BIAS FOR Q4	R6,	MIL-R-11 RC07GF392J						59056824098	0001
R7	RESISTOR, FIXED, COMPOSITION- 20 OHMS, PORM 5 PCT, 1/4 WATT	CURRENT LIMITER	R7, R8,	MIL-R-11 RC07GF200J						59058351631	0002
R8	SAME AS R7	CURRENT LIMITER									
R9	RESISTOR, FIXED, COMPOSITION- 620 OHMS, PORM 5 PCT, 1/4 WATT	VOLTAGE DIVIDING	R9,	MIL-R-11 RC07GF621J						59058016998	0001
R10	RESISTOR, FIXED, COMPOSITION- 680 OHMS, PORM 5 PCT, 1/4 WATT	VOLTAGE DIVIDING	R10,	MIL-R-11 RC07GF681J						59057278001	0001

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IDENTIFICATION TABLE OF PARTS FOR IFD15B

CONTRACTOR: LTV ELECTROSYSTEMS, INC.

CONTRACT NO.: DA18-119AMC01357X

REF. SYM. OR PART NUMBER (1)	NAME OF PARTS AND DESCRIPTION (2)	FUNCTION (3)	ALL SYMBOLS AND PART NUMBERS INVOLVED (4)	JAN OR MIL TYPE NUMBER (5)	EQUIPMENT REPAIR PART KIT QUANTITIES PER SERVICE (6) ARMY	AF	NSA	NAVY	OTHER	FEDERAL STOCK NUMBER (7)	TOTAL NUMBER PARTS PER END ITEM (8)
FIG. NO. 5-9	AMPLIFIER, AGC- **COMMUNICATION ELECTRONICS, INC PART NO. 10383-1	AMPLIFIES AGC CONTROL VOLTAGE									
A4C1	CAPACITOR, FIXED, ELECTROLYTIC- 35 VDC, 3.3 UF, PORM 10 PCT **SPRAGUE ELECTRIC CO., PART NO. 150D335X903582	FILTER WITH A4R1	A4C1,							5910809833 8	0001
A4C2	CAPACITOR, FIXED, CERAMIC DIELECTRIC- 500 VDC, 5000 PF, PORM 20 PCT **RADIO MATERIALS CORP. PART NO. SM50000PFPORM20PCT	FILTER	A4C2,								0001
A4Q1	TRANSISTOR- SILICON	DC AMPLIFIER	A4Q1, A4Q2,	MIL-T-19500 2N697						5960837015 0	0002
A4Q2	SAME AS A4Q1	EMITTER FOLLOWER									
A4R1	RESISTOR, FIXED, COMPOSITION- 30000 OHMS, PORM 5 PCT, 1/4 WATT	FILTER WITH A4C1	A4R1,	MIL-R-11 RC07GF303J						5905803290 8	0001
A4R2	RESISTOR, FIXED, COMPOSITION- 33000 OHMS, PORM 5 PCT, 1/4 WATT	VOLTAGE DROPPING	A4R2,	MIL-R-11 RC07GF333J						5905686390 3	0001
A4R3	RESISTOR, FIXED, COMPOSITION-	VOLTAGE DIVIDING	A4R3,	MIL-R-11 RC07GF471J						5905683224 2	0001
A4R4	RESISTOR, FIXED, COMPOSITION-	VOLTAGE DIVIDING	A4R4,	MIL-R-11 RC07GF183J						5905687000 0	0001
A4R5	RESISTOR, FIXED, COMPOSITION- 47 OHMS, PORM 5 PCT, 1/4 WATT	PARASITIC SUPPRESSOR	A4R5,	MIL-R-11 RC07GF470J						5905802673 0	0001

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